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The Bureau of Engineering

OF

THE PUBLIC SERVICE COMMISSION

OF THE

COMMONWEALTH OF PENNSYLVANIA

FIRST ANNUAL REPORT

For the Year Ending June 30th, 1914.

F. HERBERT SNOW, C. E., Chief.

HARRISBURG, PA.:
WM. STANLEY RAY, STATE PRINTER
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ARRANGEMENT

LETTER OF TRANSMITTAL.

PART I. INTRODUCTION.

PART II. ORGANIZATION AND ADMINISTRATION.

PART III. RULES AND REGULATIONS PERTAINING TO ELECTRIC,
GAS, HEATING AND WATER SERVICE UTILITIES.

PART IV. IMPROVEMENT OF THE PORT OF PHILADELPHIA.

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LETTER OF TRANSMITTAL

Harrisburg, Pa., June 30th, 1914.

To the Public Service Commission of the Commonwealth of Pennsylvania—Mr. Archibald B. Millar, *Secretary*.

Dear Sir:—I have the honor to submit the First Annual Report of the Bureau of Engineering.

I assumed the duties of the office of Chief of the Bureau on April 1st, 1914, the date when the Bureau was also created.

To meet a demand which is quite general among engineers for an explanation of the application and scope of the Public Service Company Law to matters appertaining to engineering, and as a partial explanation for the operations of the Bureau (limited by the Commission's directions), I have conveniently arranged the law respecting this phase of it. Any member of the profession desiring to get a comprehensive conception of the law from the engineer's standpoint, may, by reference to this digest, find the help he desires. This comprises the Introduction, or Part I of my report.

Since the fiscal year for which this report is made covers the three months' period of Bureau activities between April 1st and June 30th, it seems fitting that I should at this time make a report including not only the activities of the Bureau for the said first three months of its existence, but also containing some observations upon activities of the Commission and its agents relative to the Bureau work prior and leading up to its creation, and some observations regarding future work for which preparation is being made.

Part II of my report deals with the organization of the Bureau staff and the work accomplished by the Bureau up to June 30, 1914.

Part III deals with rules and regulations pertaining to electric, gas, heating and water service utilities and is explanatory of what has been done and what it is purposed to do in administering the orders of the Commission, framed under the law.

Certain matters relative to the development of the Port of Philadelphia have received the attention of the Commission. In this connection, the Bureau has investigated at length and made a report on the relocation and elevation of the railroads and terminal yards

and facilities in South Philadelphia. The project as approved in a general way by the Commission requires an expenditure of \$25,000,000 within the next five years, and this is a part only of the comprehensive plan for the Port improvement.

Since the regulation of express, ferry, baggage transfer, railroads, street railway and all common carriers, telephone, telegraph, wharf, refrigerator and grain elevator companies, including individuals, partnership or associations and companies engaged for profit in such business, is imposed by law on the Commission, which law defines the duties and limits the power of such companies, I have thought it pertinent at this time to set forth in some detail, and in this connection, a description of the Port of Philadelphia and the facilities which have and are likely to receive the attention of the Commission, and which have already entered into the plans studied by the Bureau. This comprises Part IV of my report.

All of which is respectfully submitted.

F. HERBERT SNOW,
Chief, Bureau of Engineering.

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PART ONE

INTRODUCTION—COMMENTS ON THE PUBLIC SERVICE COMPANY LAW.

As an aid to a better understanding of the scope of the work to be performed by the Bureau of Engineering of the Public Service Commission, attention is called briefly to the said Public Service Company Law, which defines Public Service Companies and provides for their regulation by prescribing their duties and liabilities, limiting their powers, regulating their incorporation and by creating and establishing a Public Service Commission for the regulation aforesaid.

I.—SOME CORPORATE DEFINITIONS—PERTINENT TO ENGINEERING.

PUBLIC SERVICE COMPANIES include the following corporations and also all persons (meaning all individuals, partnerships or associations, other than corporations), engaged for profit in the same kind of business, within Pennsylvania.

PUBLIC SERVICE CORPORATION ARRANGED ALPHABETICALLY.

1. Artificial Gas.	10. Grain Elevator.	19. Stage Line.
2. Baggage Transfer.	11. Heat.	20. Street Railway.
3. Bridge.	12. Incline Plane.	21. Telegraph.
4. Canal.	13. Natural Gas.	22. Telephone.
5. Common Carriers.	14. Pipe Line.	23. Tunnel.
6. Dining Car.	15. Pullman Car.	24. Turnpike.
7. Electric.	16. Railroad.	25. Water.
8. Express.	17. Refrigerator.	26. Water Power.
9. Ferry.	18. Sewage.	27. Wharf.

a—The term “SERVICE” means and includes any and all acts done, rendered or performed, and any and all things furnished or supplied by public service companies in the performance of their duties to their patrons, employees, and the public, as well as the interchange of facilities between two or more public service companies.

b—The term “FACILITIES” means and includes all plant and equipment of a public service company, and any and all means and instrumentalities in any manner owned, operated, leased, licensed, used, controlled, furnished, or supplied for, by, or in connection with the business of any public service company, which includes all tangible real and personal property, all

1. Buildings.	5. Rights of Trackage.	9. Street Railways.
2. Materials.	6. Subways.	10. Tracks.
3. Casements.	7. Tunnells.	11. Canals.
4. Rights of Way.	8. Railroads.	

AND ALL

1. Animals.	27. Barges.	53. Holders.
2. Locomotives.	28. Cables.	54. Retorts.
3. Apparatus.	29. Conduits.	55. Ducts.
4. Appliances.	30. Converters.	56. Pipes.
5. Devices.	31. Transformers.	57. Pipe galleries.
6. Instruments.	32. Condensers.	58. Pipe lines.
7. Appurtenances.	33. Wires.	59. Mains.
8. Freights cars.	34. Poles.	60. Meters.
9. Refrigerator cars.	35. Structures.	61. Lamps.
10. Baggage cars.	36. Telegraph lines.	62. Scrubers.
11. Express cars.	37. Telephone lines.	63. Wharves.
12. Passenger cars.	38. Crossbars.	64. Piers.
13. Drawing-room cars.	39. Engines.	65. Docks.
14. Parlor cars.	40. Machines.	66. Ferries.
15. Sleeping cars.	41. Dynamos.	67. Incline planes.
16. Dining cars.	42. Boilers.	68. Side tracks.
17. Rolling stock.	43. Motors.	69. Spurs.
18. Carriages.	44. Storage batteries.	70. Turn outs.
19. Cabs.	45. Switchboards.	71. Switches.
20. Hansoms.	46. Water-falls.	72. Systems.
21. Taxicabs.	47. Water-power stations.	73. Stations.
22. Vehicles.	48. Power stations.	74. Depots.
23. Boats.	49. Pumping stations.	75. Terminals.
24. Ships.	50. Reservoirs.	76. Terminal facilities.
25. Vessels.	51. Purifiers.	77. Water or gas jet.
26. Bridges.	52. Oil Tanks.	78. Wells.

II.—SOME CORPORATE DUTIES AND LIABILITIES—PERTINENT TO ENGINEERING.

a—*Service*.—It is the duty of every public service company—

“To furnish and maintain such service, including facilities as shall in all respects be just, reasonably adequate and practically sufficient for the accommodation and safety of its patrons, employees and the public, and in conformity with such reasonable regulations or orders as may be made by the Commission.”

b—*Repairs, Extensions, Etc.*—It is the duty of every public service company—

“To make all such repairs, changes, alterations and improvements in or to such service, including facilities, as shall be reasonably necessary for the accommodation or safety of its patrons, employees and the public.”

c—*Contracts*.—It is the duty of every public service company—

“To file with the Commission, when required by it, verified copies of any and all contracts, writings, agreements, leases, arrangements, or other engagements entered into by such public service company with any person, corporation, municipal corporation, any State government, the Federal government, or any branch or sub-division thereof, or other public service company, in relation to its public service.”

d—*Reports*.—It is the duty of every public service company—

“To make and file, when and in the manner and form required by the Commission, any and all reports to the Commission, which shall contain such facts, accounts and information as may be prescribed by the Commission; and, generally, to furnish any and all information required by the Commission in the performance of its duties under this act.”

e—*Maps, Profiles, Reports, Records, Etc.*—Also

“To furnish to the Commission, from time to time, and as the Commission may require, all maps, profiles, reports of engineers, books, papers, records and other documents or memoranda, or copies of any or all of them, in aid of any inspection, examination, inquiry, investigation, or hearing, or in aid of any determination of the value of its property, or any portion thereof; and to co-operate with the Commission in the work of the valuation of its property, or any portion thereof; and to furnish any and all other information to the Commission as the Commissioner may require, in any inspection, examination, inquiry, investigation, hearing, or determination of such valuation of its property and facilities.”

f—*Service and Facilities of Common Carriers*.—It is the duty of every public service company—

“If a railroad corporation or street railway corporation, or other common carrier, to furnish a reasonably sufficient number of safe trains, cars, vehicles, boats, or other facilities; and to run and operate the same with such motive power as may reasonably be required, in the conveyance of all such passengers or property as may seek, or be offered to it, for such conveyance; and to run and operate its said trains, cars, vehicles, boats, or other facilities with sufficient frequency at such reasonable and proper times, and to and from such stations or points, as the Commission, having regard to the general convenience and safety of the public, may require; and, when reasonably required by the Commission, to change the time schedule for the running and operation of its trains, cars, vehicles, boats, or other facilities; and, generally, make any other arrangement and improvements in its service which the Commission may lawfully and reasonably determine and require.”

g—*Switch Connections*.—Also it is the duty of every public service company—

“If a railroad corporation, upon application of any owner or operator of any lateral railroad, or any private side track, or of any shipper, tendering property or traffic for transportation, or of any consignee, to construct, maintain, and operate, at a reasonable place and upon

reasonable terms, a switch connection with any such lateral railroad or private side track which may be constructed to connect with its railroad, where such connection may be reasonably practicable and can be put in with safety, and will furnish sufficient business to justify the construction and maintenance of the same: Provided, That whenever any lateral line of railroad or private side-track has been so connected with a line of any railroad, or whenever any owner of such lateral railroad or any private side track has at any time heretofore sold, or leased, or shall hereafter sell or lease, such lateral railroad or side track to any railroad corporation, any person or corporation shall be entitled to connect thereunto, or to use the same, upon payment to the party incurring the primary expense thereof of a reasonable proportion of the cost of the said lateral railroad or private side track, and of the maintenance thereof, which shall be determined, in case of disagreement among the parties, by the Commission, after notice to the interested parties, and a hearing. Provided, That such connection and use can be made without unreasonable interference with the use thereof by the party incurring the primary expense or owning or leasing said lateral railroad or side track."

h—Continuous Transportation, Etc.—It is the duty of every public service company—

"If a telephone or telegraph corporation, or person or persons engaged in like business, to cause the transmission of dispatches, messages, or communications by it to be reasonably continuous, and without unreasonable interruption or delay; and, if a common carrier, to cause the conveyance of passengers and property by it to be reasonably continuous, and without unreasonable interruptions or delay."

i—Through Routes.—It is the duty of every public service company—

"If a railroad corporation or a street railway corporation, to construct and maintain whenever the Commission may require, the same, such switch or other connections with or between the lines of other companies of the same character, where the same is reasonably practical and can be connected, to form a continuous line of transportation, and to cause the companies of persons and property between points within this Commonwealth to be without unreasonable interruption or delay; and to establish through routes and service therein, and just and reasonable joint rates, fares and charges applicable thereto; and, where practicable, transport freight over the same without transfer from the originating cars; and shall not discriminate in the said rates, fares, charges, or in any rates or regulations applicable thereto, between any such connecting lines: Provided, That no railroad corporation or street railway corporation shall be required to give the use of its tracks or terminal facilities to any other common carrier: AND PROVIDED, That this section shall not apply to a street railway corporation engaged in the business of carrying passengers, but not engaged in the general business of transporting freight, and which does not generally solicit the transportation of freight, as a main branch of its business."

j—*Grade Crossings, Etc.*—It is the duty of every public service company—

“To obey and abide by all lawful orders and regulations of the Commission, made under the provisions of this act, regulating the manner in which the tracks or other facilities of any railroad corporation, street railway corporation, or any other public service company, may be constructed across the tracks or other facilities of any other railroad corporation, street railway corporation, or any other public service company, at grade, or above or below grade, or at any prescribed level; or in which the tracks or other facilities of any railroad corporation or street railway corporation may be constructed across any public highway at grade; or above or below grade; or in which any public highway may be constructed across the tracks or other facilities of any railroad corporation or street railway corporation at grade, or above or below grade; or regulating the manner in which such crossings shall be operated, maintained, and protected, including the stationing of watchmen thereat, installation and regulation of lights, blocks or other system of signalling, safety appliances, devices, or such other means or instrumentalities as the Commission may prescribe; as well as to obey and abide by all lawful orders and regulations of the Commission made under the provisions of this act, requiring the lateration, removal, or abolition of any such crossing,—to the end, intent and purpose that accidents may be prevented; and also to bear and pay the expenses, damages, or compensation incident thereto, either severally or in such proportions as the Commission may determine under the provisions of this act.”

k—*Gas, Water and Electric Meters.*—It is the duty of every public service company—

“If a gas corporation, water corporation, or other public service company, furnishing its service or product upon meter or other similar measurement, or electric corporation, to provide and keep in and upon its premises, suitable and proper apparatus to be approved from time to time and stamped or marked by the Commission for testing and proving the accuracy of gas, water, electric or other meters furnished by it for use; and by which apparatus every meter may be tested, upon the written request of the consumer to whomever the same shall be furnished, and in his presence if he shall so desire. If the meter so tested shall be found to be accurate, within such commercially reasonable limits as the Commission may, by general or special order, fix for such meters, or class of meters, a reasonable fee, to be fixed by the Commission, by standing order, sufficient to cover the cost of such test, shall be paid by the consumer requiring such test; but, if not so found, then the cost thereof shall be borne by the public service company furnishing said meter.”

III.—SOME CORPORATE POWERS AND LIMITATIONS—PERTINENT TO ENGINEERING.

a—*Participation in Economies of Method and Service.*—It is lawful for every public service company—

“To participate, to such an extent as may be permitted by the Commission, and deemed by the Commission wise, for the purpose of encouraging economies, efficiencies, or improved methods or service, in the additional profits which will be afforded by such economies, efficiencies, or improvements in methods or service.”

b—*Classification of Service.*—It is lawful for every public service company—

“To employ, in the conduct and management of its business, suitable and reasonable classifications of its service, patrons, and rates; and such classifications may, in any proper case, take into account the nature of, the use and quantity used, the time used, the purpose for which used, the kind, bulk, value, and facility of handling of commodities and any other reasonable consideration.”

c—*Approval of Incorporation.*—Upon approval of the Commission evidenced by its Certificate of Public Convenience, first had and obtained, and not otherwise, it shall be lawful for any proposed public service company—

“To be incorporated, organized, or created.” Also—

“To begin the exercise of any right, power, franchise, or privilege under any ordinance, municipal contract, or otherwise.”

d—*Additional Franchises.*—Upon approval of the Commission evidenced by its Certificate of Public Convenience, first had and obtained, and upon compliance with existing laws, and not otherwise, it shall be lawful—

“For any public service company to renew its charter, or obtain any additional rights, powers, franchises, or privileges, by any amendment or supplement to its charter, or otherwise.”

e—*Merger or Consolidation.*—Also upon like approval of the Commission, first had and obtained, as aforesaid, and upon compliance with existing laws, and not otherwise, it shall be lawful—

“For any public service company to sell, assign, transfer, lease, consolidate, or merge its property, powers, franchises, or privileges, or any or all of them, to or with any other corporation or person.”

f—*Municipal Plant.*—Also, upon like approval of the Commission, first had and obtained, as aforesaid, and upon compliance with existing laws, and not otherwise, it shall be lawful—

“For any municipal corporations to acquire, construct, or begin to operate, any plant, equipment or other facilities for the rendering or furnishing to the public of any service of the kind or character already being rendered or furnished by any public service company within the municipality.”

“PROVIDED, however, that nothing herein contained shall interfere with or effect the right or power of a municipal corporation to continue the operation of its municipal plant, or to extend the same, within the territory of such municipal corporation, or any part thereof, which is not being sufficient by a public service company rendering or furnishing service of a like kind or character: And provided further, that any municipal corporation, which at the time this act becomes effective, has, by authority of law, in process of construction any such plant for the rendering or furnishing to the public of any such service, may proceed with and complete the said construction, and begin to operate the same, without the aforesaid approval of the Commission first had and obtained.”

g—*Commission's Valuation and Certificate.*—It is lawful for any public service company—

“To issue stocks, trust certificates, bonds, notes, or other evidences of indebtedness or other securities, or make any increase in the issue thereof, in the manner prescribed by law, for and only for money, labor done, or money or property actually received, in accordance with the requirements of the Constitution and the laws of the Commonwealth.”

“Application as hereinafter provided may be made by such public service companies to the Commission for a Certificate of Valuation, to the effect that the provisions of this section have been complied with as to any stocks, trust certificates, bonds, notes, or other evidences of indebtedness or other securities, issued after the passage of this act; such application shall certify as to the number and amount thereof to be issued and the purpose of such issue, and shall contain such other facts and detailed information, and be in such form, as the Commission shall determine and prescribe, and shall be signed and verified by the affidavit of the treasurer, auditor, controller, or other acting fiscal head of the public service company.”

h—*Construction of Crossings.*—It is lawful for any public service company—

“Upon the approval of the Commission, evidenced by its Certificate of Public Convenience first had and obtained, and not otherwise, it shall be lawful for any railroad corporation or street railway corporation to construct its tracks or other facilities across the tracks or other facilities of any other railroad corporation or street railway corporation, or across any public highway, at grade, or above or below grade, or for any public highway to be constructed across the tracks or other facilities of any railroad corporation or street railway corporation, at grade, or above or below grade; or for any public service company to construct any of its facilities across the facilities of any other public service company at the same or different levels. And it shall be lawful, upon like ap-

proval first had and obtained, and act otherwise, for any public service company to alter, relocate, remove, or abolish any such crossing: PROVIDED, however, that in all cases in which the tracks or other facilities of a railroad corporation or street railway corporation across the tracks or other facilities of another railroad corporation or street railway corporation or a public highway at grade, and such crossing is at the time, this act becomes effective in process of abolition, under and in accordance with an agreement or contract entered into with any municipality providing for such abolition, it shall be lawful to proceed with the consummation of such abolition as provided in such agreement or contract, without the aforesaid approval of the Commission first being obtained."

i—*Capitalization.*—It is unlawful for any public service company—

"To capitalize its franchises, rights, powers, privileges, or right to own and operate or enjoy any such franchises, rights, powers, or privileges, in excess of the amount paid to the Commonwealth or any political subdivision thereof as the consideration for the grant thereof; or to capitalize any lease, or contract of sale, or contract for consolidation or merger of two or more public service companies; or to issue by way of substitution any capital stock, trust certificates, bonds, notes, or other evidence of indebtedness or other securities, for any consolidated or merged company, exceeding the aggregate values of the properties of the companies so consolidated or merged, and any additional sum actually paid in, in cash, and any additional property or labor actually contributed: PROVIDED, That any such public service company or companies may apply to the Commission to determine such consideration or values aforesaid."

j—*Issue of Securities by Reorganized Companies.*—It is unlawful for any public service company—

"In the case of any reorganization under the provisions of the Act of Assembly approved the eighth day of April, Anno Domini, one thousand eight hundred and sixty-one, entitled 'An act concerning the sale of railroads, canals, turnpikes, bridges, and plank roads,' or any supplement thereto or amendments thereof, to issue any stock, trust certificates, bonds, notes, or other evidences of indebtedness or other securities, in excess of the amount paid or agreed to be paid to the Commonwealth or any political subdivision thereof, as the consideration for the grants of any franchises, rights, powers, or privileges and the value of the property of such reorganized corporation (and any additional sum actually paid in cash and any additional property or labor actually contributed): PROVIDED, That any such public service company may apply to the Commission to determine such consideration or value, aforesaid."

k—*Contracts and Agreements.*—

"No contract or agreement between any public service company and any municipal corporation shall be valid unless approved by the Commission: PROVIDED, That, upon notice to the local authorities concerned, any public service company may apply to the Commission, before the consent of the local authorities has been obtained, for a declaration by the Commission of the terms and conditions upon which it will grant its approval of such contract or agreement, if at all."

IV.—THE PUBLIC SERVICE COMMISSION—ITS POWERS AND DUTIES PERTINENT TO ENGINEERING.

a—*Officers.*—The law creating and establishing The Public Service Commission of the Commonwealth of Pennsylvania, provides—

“The Commission shall have power to employ during its pleasure, and at such rates of compensation as it may determine, such officers, experts, engineers, statisticians, accountants, inspectors, clerks, and employees as it may deem necessary to carry out the provisions of this act, or to perform the duties and exercise the powers conferred upon the Commission.”

b—*Qualifications and Restrictions.*—The law provides—

“No person shall be appointed a member of the Commission, or hold any place, position, or office under it, who occupies any official relation to any public service company doing business in this Commonwealth, or who holds any other appointive or elective office of the Commonwealth or any municipality thereof. No Commissioner shall during his term be a candidate for any such office.”

“No Commissioner and no employee, appointee, or official engaged in the service of, or in any manner connected with, said Commission, shall hold any office or position, or be engaged in any business, employment or vocation, the duties of which are incompatible with the duties of his office or employment as Commissioner, or in the service or in connection with the work of the Commission. No Commissioner shall participate in any hearing or proceeding in which he has any direct or indirect pecuniary interest. Every Commissioner, the said secretary, attorneys, marshal and investigator of accidents, and every individual employed or appointed to office under, in the service of, or in connection with the work of, the Commission, is hereby forbidden to solicit, suggest, request, or recommend, directly or indirectly, to any public service company, or to any officer, attorney, agent, or employee thereof, the appointment of any individual to any office, place, or position in, or the employment of any individual in any capacity by, said public service company.”

c—*Bribery.*—The law provides—

“Every public service company and every officer, attorney, agent, or employee, is hereby forbidden to offer to any Commissioner, the said secretary, attorneys, marshal, or investigator of accidents, or to any person appointed or employed by the Commission, to any office, place, appointment, or position; or to offer to give any Commissioner, the said secretary, attorneys, marshal or investigator of accidents, or to any person employed in the service of the Commission or in connection with the work of the Commission, any free pass or transportation, or any reduction in fares to which the public generally is not entitled, or any free carriage of property or any present, gift, or gratuity, money or valuable thing of any kind.”

d—*General Administrative Powers.*—The Commission has general administrative power and authority, to supervise and regulate all public service companies doing business within the Commonwealth.

"Said power and authority shall include the power to inquire into and regulate—

1. *SERVICE AND RATES.*—"The service, rates, fares, tolls or charges of any and all public service companies including individual and joint rates, the charges for long and short transmission of messages and conversations by telegraph and telephone companies;"

2. *EXTENSIONS.*—"The making of repairs, alterations and improvements in and to such service; as shall be reasonably necessary for the accommodation or safety of its patrons, employees, and the public;"

3. *TRANSFERS.*—"The granting of transfers to or from one part of the system of the same common carrier to another part;"

4. *ROUTING.*—"The routing of the lines of street railways, under the provisions of the act, entitled 'An act authorizing traction or motor power companies, and street passenger railway companies, owning, leasing, controlling, or operating different lines of street railways, to operate all of said lines as a general system, and to lay out such new routes or circuits over the whole or any part of the street or streets occupied by such different companies, and to run cars thereon for such distances and in such directions as will in the opinion of the operating company, best accommodate public travel,' approved the fifteenth day of May, Anno Domini, one thousand eight hundred and ninety-five (Pamphlet Laws, sixty-five), or otherwise;"

5. *DISTRIBUTION OF CARS.*—"The just and equitable distribution of trains, cars, vehicles, and motor power, or other facilities, of all common carriers;"

6. *SWITCHES.*—"The granting, construction, operation, or discontinuance of switches, sidings, and crossings;" "The construction, operation, or discontinuance of switch connections with or between lines of railroad corporations;"

7. *FACILITIES.*—"The location or abolition of freight and passenger stations, wharves, docks, or piers; the use and compensation for cars owned or controlled by persons other than the carrier; the safety, adequacy and sufficiency of the facilities, plant, and equipment for the carrying on of their business by said public service companies; the quantity or quality of water, gas, electricity, or light, heat or power, supplies;"

8. *SECURITIES.*—"And as specifically provided in their act, the issuing of stocks, trust certificates, bonds, notes, or other evidences of indebtedness or other securities by public service companies."

e—*Service.*—The law provides—

“Whenever the Commission shall determine, after hearing, had upon its own motion, or upon complaint, as hereinafter provided, that the service, facilities, rules, regulations, practices, or classifications of any public service company, in respect to, or in connection with, or employed by, or in the performance of, its public duties within this Commonwealth, are unsafe, inadequate, insufficient, unjust or unreasonable, the Commission shall determine, and specify by an order in writing to be made and filed as hereinafter provided, and to be served as hereinafter provided, upon every public service company to be affected thereby, the just, reasonable, safe, adequate and sufficient service, facilities, rules, regulations, or practices thereafter to be put in force, observed, rendered, used, or furnished in the performance of its duties by said public service company or companies; and thereupon it shall be the duty of every public service company affected by said order to observe and obey said order, and all and every the mandates and requirements thereof.”

f—*Connections and Through Routes of Railroads and Railways.*—The law provides—

“The Commission shall have power to require railroad corporations and street railway corporations to construct and maintain such switch or other connections, with or between the lines of other companies of the same character, as are reasonably practicable and as the Commission shall deem necessary and proper for the service accommodation, and convenience of the public; and shall also have power to establish through routes and joint rates and classifications, for the conveyance of persons and property between any two or more points within this Commonwealth, wherever the railroad corporations concerned shall have refused or neglected voluntarily to establish such through routes and joint rates and classifications and to prescribe the just terms and conditions under which said through routes shall be operated: Provided, That, in establishing such through routes, the Commission shall not require any railroad company, without its consent to embrace in such routes substantially less than the entire length of its railroad and of any intermediate railroad, operated in conjunction and under a common management or control therewith, which lies between the termini of such proposed through route, unless to do so would make such through route unreasonably long as compared with another practicable through route which would otherwise be established.”

“The Commission shall, in case of failure of the railroad corporations and street railway corporations concerned to agree among themselves upon the division of the cost of construction, maintenance, and operation of the connections thus provided for, or the allowance to be made for the interchange of service, or the appointment of any joint rates, ascertain, and by order prescribe and fix the equitable and just apportionment of division of the same.”

“Nothing in this section shall give the Commission power over street railway corporations engaged in the business of carrying passengers, but not engaged in the general business of transporting freight, and which do not generally solicit the transportation of freight as a main branch of their business.”

g—*Connction of Telegraph Lines.*—The law provides—

“In the case of a telegraph corporation, or person engaged in the public telegraph business, the Commission may also, whenever it may determine it to be necessary or proper for the accommodation or convenience of the public so to do after hearing had upon its own motion or upon complaint, require any such telegraph corporation or person to permit any other such telegraph corporation, or person engaged in the public telegraph business, to connect its or his lines of telegraph with the lines of telegraph of such first-named telegraph corporation or person; and inter-changeably to receive dispatches from and for each other, and from and for and individual or individuals; and, on payment of its or his usual charges to individuals for transmitting dispatches, as established by the rates and regulations of such telegraph corporations or person, or by the Commission as hereinafter provided, to transmit such dispatches with impartiality and good faith.

h—*Connection of Telephone Lines.*—The law provides—

“Whenever the Commission shall find that there are any two or more telephone companies where lines form a continuous line of communication, or could be made to do so by the construction and maintenance of suitable connections between the several lines at common points, for the transmission of conversations between different localities which are not reached by the lines of either company alone, and that such connections and facilities for the through transmission of conversations, jointly over the several lines, can reasonably be made, and an efficient service can be obtained without injustice to either company, and without substantial impairment or detriment to the service to be rendered by either company, and that a public necessity exists therefor; or shall find that any two or more telephone companies have failed to establish just and reasonable joint rates or charges for through service, by or over several lines so connected, and that such joint rates or charges ought to be established, in order to supply a through traffic and communication between different localities not otherwise provided for, or proffered by the companies in question, or either of them,—the Commission may by its order require that such connection be made and facilities supplied, that through conversations be transmitted thereby; and may prescribe the through line and joint rates and charges to be made and to be used and in force in the future; and shall appoint or approve necessary and proper conditions, rules, and regulations for the joint through traffic, and an equitable apportionment between the several companies of the costs and revenues in connection therewith, and the Commission may fix the same by its order, to be duly served upon the company or companies affected.”

i—*Crossings.*—The law provides—

1. At Grade or Above or Below.—“Except in cases in which crossings are in process of abolition at the time of the passage of this act, under agreement or contract, with a municipality as set forth in the proviso of section five of article three of this act, the Commission shall have exclusive power to determine, order and prescribe, in accordance with plans and specifications to be approved by it, the just and reasonable

manner, including the particular point of crossing, in which the tracks or other facilities of any public service company may be constructed across the tracks or other facilities of any other public service company at grade, or above or below grade, or at the same or different levels; or in which the tracks or other facilities of any railroad corporation or street railway corporation may be constructed across the tracks or other facilities of any other railroad corporation or street railway corporation, or across any public highway at grade, or above or below grade; or in which any public highway may be constructed across the tracks or other facilities of any railroad corporation or street railway corporation at grade, or above or below grade; and to determine, order and prescribe the terms and conditions of installation and operation, maintenance, of all such crossings which may now or hereafter be constructed, including the stationing of watchmen thereat, or the installation and regulation of lights, block or other system of signaling, safety appliances, devices, or such other means or instrumentalities as may to the Commission appear reasonable and necessary,—to the end, intent, and purpose that accidents may be prevented and the safety of the public promoted.”

2. **APPROVAL.**—“No such crossing shall be constructed without the approval of the Commission, evidenced by its “Certificate of Public Conveniences,” as provided in section five of article three of this act; but in no case shall the approval or consent of any court, board, or other commission or officer, or of any municipality, be necessary therefor.”

3. **GENERAL RULE.**—“It shall be proper, however, for the Commission by general rule or order, whenever the same can be properly regulated by suitable general rule, to prescribe the terms and conditions under which such crossing may be constructed, operated, maintained, or protected, without the particular approval of the Commission.”

4. **RELOCATION, ALTERATION, ABOLITION.**—“The Commission shall also have exclusive power, upon its own motion or upon complaint, and after hearing as hereinafter provided (of which all the parties in interest, including the owners of adjacent property, shall have due notice), to order any crossing aforesaid, non-existing or hereafter constructed at grade, or at the same or different levels, to be relocated or altered, to be abolished, according to plans and specifications to be approved and upon just and reasonable terms and conditions to be prescribed, by the Commission.”

5. **COMPENSATION FOR DAMAGES.**—“The compensation for damages which the owners of adjacent property, taken, injured or destroyed may sustain in the construction, relocation, alteration, or abolition, of any such crossing specified in this section (for which compensation the said owners are hereby invested with warrant of authority, upon appeal from the determination of the Commission to sue the Commonwealth), shall, after due notice. A hearing, be ascertained and determined by the Commission; and such compensation, as well as the expense of the said construction, relocation, alteration or abolition of any such crossing, shall be borne and paid, as hereinafter provided by the public service company or companies or municipal cor-

porations concerned, or by the Commonwealth, either severally or in such proper propositions as the Commission may, after due notice and hearing, in due course determine, unless the said proportions are mutually agreed upon and paid by those interested as aforesaid."

6. **TERMS AND CONDITIONS.**—"In prescribing the terms and conditions, upon which any such crossing may be constructed or relocated, or altered or abolished, and the proportionate contributions to the expense thereof, including the damages or compensation to the owner of adjacent property, as aforesaid, the Commission may, among other things, take into consideration the relative importance to the public of the services rendered by the public service companies concerned, as well as the priority of location: **PROVIDED**, That where any portion of the cash and expense thereof shall have been or shall be borne in the future by the Commonwealth or any municipal corporation, such portion shall not be taken into account by the Commission in fixing any valuation, for any purpose, under any of the provisions of this act: **AND PROVIDED FURTHER**, That where the order of the Commission shall, as part of the regulation of the construction, relocation, alteration or abolition of any crossing aforesaid, require, as incidental thereto, a relocation, changes in or removal of any adjacent structures, equipment or other facilities of any telegraph, telephone, gas, electric light, water-power, water pipe-line, or other public service company, said company shall, at its own expense, relocate, change or remove such structures, equipment, or other facilities, in conformity with the order of the Commission; and in default of compliance with such order, the Commission shall cause the work and materials to be done and furnished in accordance with the said order, and may recover the cost and expense thereof from the said public service company."

7. **FINAL ORDER.**—"Before the Commission shall make any final order relative to the construction, relocation, alteration or abolition of any crossing involving any public highway or street, an effort shall be made by the Commission to reach an agreement with the proper officials of the municipal corporations concerned, determining the plans and specifications governing such crossings; and, in default of such agreement, the Commission shall exercise the exclusive power vested in it under this section and shall finally determine and adopt the complete plans and specifications and locate all lines and grades in said public highways and streets, and may permit the public service company or companies, or the municipal corporation to do the whole or any portion of the work in accordance therewith; otherwise the Commission shall do the work by contract or contracts, to be awarded, after due advertisements, to the lowest responsible bidder in accordance with the said plans and specifications."

8. **RIGHTS OF CONTRACTOR.**—"The said contractor shall be authorized, in the name of the Commission, to collect by due process of law from the public service company or companies or the said municipal corporation, or from the Commonwealth, either severally or proportionately as may be determined by the Commission, the amount which may be justly due him under the terms of his said contract with the Commission; and any amount so determined to be paid the said contractor by the Commonwealth, as well as the amount of damages or compensation determined and awarded to be paid the owners of adjacent property, as aforesaid, shall in each instance be paid by the State Treasurer, or

a warrant drawn by the Auditor General, upon the presentation to that officer of a statement setting forth the amount determined to be paid as aforesaid, duly certified by the Commission, said payment to be paid out of any funds specifically appropriated for the improvement of the roads or highways of the Commonwealth; and in case of a verdict and judgment thereon for the damages or compensation, recorded by any such adjacent property owned upon appeal, the same shall be paid out of any funds appropriated as aforesaid; and any court of common pleas hearing and determining said appeal is hereby authorized and empowered to issue a writ of mandamus to said Commission, the Auditor General and the State Treasurer, or any of them as the case may require, for the payment of such judgment."

9. **RECOVERY BY THE COMMISSION.**—"The Commission shall have the right to recover, for and on behalf of the Commonwealth, by due process of law, as debts of like amount are now by law recoverable from the public service company or companies, or municipal corporations, in such amounts or proportions against each as may be determined by the Commission, as aforesaid, the amount of the damages or compensation awarded to the owners of adjacent property by the Commission, or by the Court of the proper county on appeal, and the amounts so recorded shall be paid into the State Treasury for the improvement of the roads of the Commonwealth."

j—*Standard of Service.*—The law provides—

"The Commission may, after hearing had upon its own motion or upon complaint, establish such standards of facilities and service of public service companies as shall be reasonably necessary for the safety, accommodation, or convenience of its patrons, employees, and the public; and require, by an order to be served in the manner hereinafter provided upon every public service company affected thereby, the facilities or service of such public service companies to conform to such standards. The Commission shall also have power, after hearing had upon its own motion or upon complaint, to require public service companies to make all such repairs, changes, alterations, extensions, and improvements, in and about their facilities and service, as shall be reasonably necessary and proper for the safety, accommodation, convenience, and service of their patrons, employees, and the public."

k—*Reports, Records, Maps.*—The law provides—

"The Commission shall at all times have access to all accounts, records, and memoranda kept by public service companies; and may designate any of its officers or employees, who shall therefore have authority to inspect and examine any and all accounts, records, and memoranda kept by such public service companies. The Commission shall also have power to require the making and filing with it of all reports, records, maps, documents, data, and information, whenever it deems the same necessary and proper in the public interest or to carry out the provisions of this act: PROVIDED, That where any municipal corporation is engaged in rendering or furnishing to the public any service of the kind or character rendered or furnished by public service companies, the provisions of this section shall apply to said municipal corporation with respect to such service."

l—*Facilities and Service.*—The law provides—

“If the Commission shall find it necessary and proper to the rendering of reasonably safe and adequate or sufficient service it may, and shall after hearing had upon its own motion or upon complaint, make an order, to be served as hereinafter provided upon every common carrier to be effected thereby, requiring all such common carriers to revise and change the time schedules of such common carriers; to alter the running time of trains, cars, vehicles, or boats, or changes in the routes of street railway lines or systems; or regulating or requiring the furnishing and distribution of cars, trains, vehicles, boats, motive power, or other facilities, without undue or unreasonable discrimination or preference between shippers, localities, or competitive or non-competitive points; and the switching, loading, and unloading of said trains, cars, vehicles, boats, or other facilities; the weighing or billing of cars and of property offered for shipment; or regulating demurrage charges, track storage charges, package-room or baggage-room charges, and package or baggage transfer rates and charges; and, generally, to make such other arrangements and improvements in service and facilities as shall be just and reasonable, having due regard to the needs of the public under all the circumstances presented.”

m—*Public Convenience or Safety.*—The law provides that when application is made to the Commission by any public service company for any approval under any provisions of this act; or when application is made to the Commission by any municipal corporation for the approval required by the provisions of article three, section three (d), of this act—

“Such approval, in each and every such case, or kind of application, shall be given only if and when the said Commission shall find or determine that the granting or approval of such application is necessary or proper for the service, accommodation, convenience, or safety of the public.”

n—*Certificate of Public Convenience.*—Continuing the law further provides—

“For the purpose of enabling the Commission to make such finding or determination it shall hold such hearings, which shall be public, and subpoena and examine such witnesses, and compel the production of and examine such witnesses, and compel the production of and examine such books, papers, contracts, or other documents, and make such inquiries, physical examinations, valuations, and investigations as it may deem necessary or proper, in enabling it to reach a determination. Due notice of every such hearing shall be given, and in every case the Commission shall make a finding or determination in writing, stating whether or not its approval is given and, if given, shall issue its certificate, to be known as its Certificate of Public Convenience, under its seal, and file among its records a duplicate of every such certificate.”

o—*Determination of Fair Value of Property*—

1. **AUTHORITY.**—"The Commission shall have power, upon application or upon its own motion, to ascertain and determine the fair value of the property of every public service company in this Commonwealth, and to determine any matter in connection therewith; and shall exercise the said power whenever the same is required, or whenever it shall deem such valuation or determination necessary or proper under any of the provisions of this act."

2, 3, 4, 5, 6. **HOW DETERMINED—ORIGINAL COST—BONDS AND STOCKS—EARNING CAPACITY—REPRODUCTION COSTS.**—"In ascertaining and determining such fair value, the Commission may determine every fact, matter, or thing which, in its judgment, does or may have any bearing on such value; and may take into consideration, among other things, the original cost of construction, particularly with reference to the amount expended in the existing and useful permanent improvements; with such consideration for the amount in market value of its bonds and stocks, the probable earning capacity of the property under particular rates prescribed by statute or ordinance, or other municipal contract, or fixed or profered by the Commission, and for the items of expenditures for obsolete equipment and construction, as the circumstances and the historical development of the enterprise may warrant; the reproduction cost of the property, based upon the fair average price of materials, property, and labor, and the development and going concern value of such public service company; and these, and any other elements of value, shall be given such weight by the Commission as may be just and right in each case."

7. **REVALUATIONS.**—"The Commission shall also have power to make revaluations of the property of any public service company, from time to time, and to ascertain and determine the value of new construction, extensions, and additions to the same."

8. **RULES.**—"The Commission shall have power to establish reasonable general or special rules with respect to the preparation of such valuations, the forms to be followed, the inventories and statements and proofs of original cost to be made, and all other matters, figures, data, and information in connection therewith."

p—*Certificate of Valuation.*—The law further provides, when application shall be made to the Commission by any public service company—

1. **FRANCHISE.**—"For the ascertainment and determination of the amount paid or agreed to be paid to the Commonwealth, or any political sub-division thereof, as the consideration for the grant of any franchises, rights, powers, privileges, or right to own or operate or enjoy any such franchises, rights, powers, or privileges."

2. **CONSOLIDATION AND MERGER.**—"Or for the ascertainment and determination of the aggregate values of the properties of any public service companies consolidated or merged;"

3. REORGANIZATION.—“Or for the ascertainment and determination of the value of the property of any public service company reorganized, under the provisions of an act of Assembly approved the eighth day of April, one thousand eight hundred and sixty-one, entitled ‘An act concerning the sale of railroads, canals, turnpikes, bridges, and plank roads,’ or any supplement thereto or amendments thereof;”

4. STOCK INCREASE.—“Or for a certificate that the provisions of paragraph (a) of section four of article three of this act, relating to the issuing of stocks or making any increase in the issue thereof by public service companies, have been complied with;”

5. PROPERTY OR LABOR.—“Or for the ascertainment and determination of the value of any property or labor, for which any bonds, notes, or other evidences of indebtedness, running for more than twelve months, are issued;”

6. PUBLIC HEARINGS.—“Or for the ascertainment and determination of the value of any other fact, matter, or thing of which the Commission is authorized to ascertain and determine the value under the terms of this act,—then, and in every such case, for the purpose of making such ascertainment or determination of value, the Commission shall hold such hearings, which shall be public, and subpoena and examine such witnesses, and compel the production of, and examine such books, papers, or other documents, and make such inspections, inquiries, physical examinations, valuations and investigations, as it may deem necessary or proper to enable it to reach a determination. Due notice of every such public hearing shall be given, and in every such case the Commission shall make a finding or determination in writing, stating the value ascertained by the Commission, and shall issue its certificate, to be known as its Certificate of Valuation, under its seal, and file among its papers a duplicate of every such certificate. Any such findings or determinations shall be subject to the right of rehearing and appeal, as hereinafter provided.”

7. REHEARING AND APPEAL.—“The issuing by the Commission of any Certificate of Public Convenience or any Certificate of Valuation, enumerated or provided for in this act, or any finding, determination, or order made by the Commission, refusing or granting such certificates, shall not be construed to revise or validate any lapsed, terminated, invalidated, or void powers, franchises, rights, or privileges; or to enlarge or add to the rights, powers, franchises, or privileges contained in any charter, or in the grant of any franchise or any supplement or amendment to any charter, or to waive or remit any forfeiture.”

8. WHAT A CERTIFICATE IS AND IS NOT.—The issuing by the Commission of any Certificate of Valuation, enumerated or provided for in this act, shall be deemed to certify only to the fact that said securities were issued for money, labor done, or money or property actually received; and shall not be taken as requiring the Commission, in any subsequent valuation of the property of any public service company, for the purposes of ascertaining the amount to be paid to said public service company for its property, to fix a valuation which shall be sufficient to yield a return to the holders of said securities; neither shall said Certificate of Valuation be deemed to require the Commission, in subsequently determining the rates to be charged for the service of said public service company, to provide a rate which shall be sufficient to yield a return on said securities.”

PART TWO

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PART TWO

BUREAU ORGANIZATION AND ADMINISTRATION.

1. BUREAU STAFF.

The following is a detailed statement of the operations of the Bureau of Engineering to the end of the fiscal year June 30th, 1914, being the first annual report made by the Bureau.

The Public Service Commission of the Commonwealth of Pennsylvania (created under the provisions of Act No. 854, approved July 26, 1913, effective for all purposes January 1, 1914, entitled The Public Service Company Law) established the Bureau of Engineering on April 1st, 1914, and appointed F. Herbert Snow, C. E., to be Chief of the Bureau.

The writer immediately assumed the duties of his office.

John B. F. Laurie, former draftsman of the Pennsylvania Railroad Commission, was assigned to the Bureau Staff.

Addison C. Gumbert, appointed to the position of Inspector of Meter Provers, was also assigned to the Bureau Staff. At the end of the fiscal year, Mr. Gumbert had not fairly started on his work of testing meter provers; but he had been engaged on special work preparatory to field operations.

For several days in April, John C. Reed, Electrical Engineer, and H. E. Stephenson were employed on special expert investigations. Mr. Reed reported on the Ashland and Exeter light and power plants.

M. Irene Cuenot was appointed chief stenographer May 1st. Additional stenographic and clerical assistants have been furnished from the Secretary's office as requested.

In June R. H. Fernald, M. E. and professor at the University of Pennsylvania, and L. H. Harris, E. E. and professor at the University of Pittsburgh, were added to the Bureau Staff, in the capacity, however, of consulting engineers. These two experts in their respective specialties rendered conspicuous service to the Commission prior to the creation of the Bureau, as fully described in Part 3 of this report.

Professor H. E. Ehlers, who assisted Prof. Fernald in preparing the rules and regulations to govern certain public utilities, was assigned to active field work for the Bureau in June. He begun investigations of gas, water and heating utilities. Professor Harris at the same time investigated electrical utilities. An account of this work may be found in Part 3.

The scheme of Bureau organization is outlined in the diagram shown on the following page.

2. OFFICE WORK.

The Bureau has occupied Room No. 327, centre wing, third floor of Capitol, adjoining the other rooms used by the Commission. These accommodations are being rapidly outgrown. Additional and suitable quarters must be obtained for the testing laboratories. Arrangements have been made for the temporary use at the University of Pittsburgh of its electrical standard testing apparatus, but finally for efficiency and economic management, the standardizing laboratories for testing electrical, water and gas standards will have to be erected and maintained at a central point,—without doubt, Harrisburg.

The work of the office force for the first three months of the Bureau's existence, has been gradually crystallizing into form and classification. The duties of a chief clerk have been performed by the chief stenographer and by the draftsman; in fact both making themselves generally available. The Chief of the Bureau also has had to turn his hand to work which it will not be profitable for him to perform when the Bureau Staff is sufficiently augmented.

Besides routine matters such as correspondence, filing, plan registers, etc., references to and help given the several bureaus of the Commission, listing of utilities and the preparation and use of blank forms for administering and recording purposes, there are special matters, such as petitions and complaints regarding service and facilities of utilities which are referred to the Bureau. The following is a list of such petitions and complaints.

Serial Number.	Date received.	Cause of Complaint.	Locality.	Utility.
1	4-20	Dangerous wire crossing, .	Catherine Twp.,	Penn Central L. & P. Co.
2	4-21	Dangerous wire crossing, .	Mapleton,	Penn Central L. & P. Co.
3	4-21	Dangerous wire crossing, .	Mt. Union,	Penn Central L. & P. Co.
4	6-17	Dangerous wire crossings, .	Petersburg,	Penn Central L. & P. Co.
5	5-1	Inferior plant and service, .	Exeter,	Citizens El. Ill. Co.
6	5-1	Defective meter and excessive charges, .	Clearfield,	Penn Public Ser. Co.
7	5-4	Inadequate service,	Harrisburg,	Susquehanna Water Co.
8	5-5	Unsafe condition,	Harrisburg,	Peoples Bridge Co.
9	5-21	Poor facilities, toilet, etc.	Gettysburg,	Western Maryland Railroad.
10	5-28	Dangerous wire crossings, .	St. Benedict,	Penn Central L. & P. Co.

The initiation of the Commission also creates work for the Bureau. For instance, the preparation of rules and regulations for governing public service companies and the preparation for administering them were a very considerable task. Reference for particulars may be had to Part 3 of this report; also to Section 10 of Part 2.

In one case, namely the Port of Philadelphia matter, the scope included such a large physical territory and complexity of interests coming within the jurisdiction of the Commission, and yet all being really the parts of one great plant susceptible to centralized organization and control, it was thought essential that there should be a systematic collaboration of data in relation thereto and its presentation in report form for reference and publication. This has been undertaken by the Bureau and it comprises Part 4 of this report.

The Commission decided to look into the matter of providing that each street car shall carry a jack. Hence hearings were given, testimony was taken, types of devices of this kind were looked up and finally an order was made.

3. BRIDGES.

a—ETNA HIGHWAY BRIDGE.

The bridge in question is on Butler Street over Pine Creek in the Borough of Etna, Allegheny County, and it sustains the double tracks of the Pittsburgh Railways Company and the ordinary traffic of said street. The bridge has a roadway of eighteen feet, one and one-half inches in the clear, and one sidewalk five feet in width, and is sixty feet in length. The superstructure consists of two plate girders of steel five feet in height to which are connected fifteen inch cross beams of steel, spaced six feet six inches on centres. The two tracks of the Pittsburgh Railways Company rest directly on said beams, and the three inch plank floor is supported by 6" x 6" wooden joists, also resting on said cross beams. Said girders are supported by timber grillage from three to four feet in height resting upon masonry and concrete abutments. One of the said abutments near the up-stream end is in a damaged condition. The timber grillage supporting the girders is unsound in part and unsafe.

There is a vertical clearance between the bottom of the main girders and the ordinary water level in the creek of approximately nine feet six inches, but extreme high water in the creek has flooded the surface of the highway at the bridge, which surface is twelve and one half feet above the ordinary water level.

During the last great flood in Pine Creek, heavy floating material was brought down by the waters and lodged against the upper main girder, damaging the abutments and forcing some of the timber grillage out of place, and straining the bridge sufficiently to cause the said main girder to lean over three or more inches out of plumb in its height of five feet. The other main girder, however, retains its true vertical position. The lateral bracing underneath the roadway is partly broken and partly warped. These defects should be remedied without delay.

The structure is known as a thorough girder bridge. That is, the main girders project about two and one-half feet above the roadway, so that the leaning out of plumb of the up-stream main girder, this girder supporting the sidewalk, is very apparent to the passersby, and in consequence disturbs the public sense of security more than if the defect of the bridge were not apparent.

The sectional area for the passage of water underneath the bridge is insufficient to discharge the run-off from the extended and precipitous water shed above, during periods of prolonged and intense rainfalls. Any month of the year a freshet may occur that would further endanger the safety of this structure, and each freshet would necessarily weaken the bridge and its supports.

There is no doubt but that a wider waterway is needed.

Furthermore, Butler Street is a main thoroughfare out into the County, and it is sixty feet wide either side of the bridge and permanently surfaced for the entire width. The traffic is sufficient here to warrant the bridge being sixty feet wide.

The Pittsburgh Railways Company assumes the position of having no responsibility for the maintenance of the existing bridge, except to maintain the surface thereof between its tracks, and twelve inches outside thereof. The Company asserts that it was given permission to lay its tracks over Pine Creek the same as it has been given permission to use the County bridge in other instances. Therefore it has assumed no responsibility for the strength or maintenance of the bridge, except to care for the surface at and near the tracks as previously mentioned.

The bridge is entirely within the Borough limits. The Borough has prepared plans for a new bridge ample in size and sectional area to meet all demands at this place. The Pittsburgh Railways Company assisted in the preparation of these plans, and the Borough has received bids, and ascertained that the cost will be in the neighborhood of \$15,000.00 for the completed structure.

The channel of the stream being changed slightly, the plans will necessarily require the approval of the Water Supply Commission. The main question at this time which concerns the Borough, is whether the Railways Company will share to a material degree in the cost of this improvement. The Railways Company has not declined to pay anything towards the improvement, but the Borough wishes to secure from the Railways Company fifty per cent. of the cost of the improvement, and here the matter lies.

The Public Service Commission notified both the Borough and the Pittsburgh Railways Company that the said bridge at the present time is unsafe and that the foundations and timber supports of the bridge shall forthwith be made ample and secure. Also that the Pittsburgh Railways Company be directed to make a critical examination of the girders and beams and lateral bracing of the bridge, and to put the same into first class condition at once.

It appears that the bridge was erected by the said Pittsburgh Railways Company principally for its own use, since its heavy cars could not have been safely supported by the structure which originally existed over Pine Creek at this place, and hence the suggestion hereinbefore made, that the Company be directed to put this bridge in first class condition.

b—THE PEOPLE'S BRIDGE OVER SUSQUEHANNA RIVER.

About twenty-five years ago or more, the present steel truss bridge spanning the Susquehanna River opposite Walnut Street, Harrisburg, Dauphin County, was constructed. It is now owned by the Peoples Bridge Company of Harrisburg.

The Valley Railways Company has acquired the right to operate and maintain a trolley track on this bridge. This Railways Company sells to other trolley companies the privilege of operating cars on said tracks, and it is via this structure that all street cars enter Harrisburg from the Cumberland Valley side of the river.

When the bridge was designed and erected, heavy eight truck street cars were not in existence. Traffic has increased and necessarily the live load on the bridge, until at the present time the structure is not considered safe by the public, although there is a sort of assurance that the bridge must be sound and safe, or the owners would not permit it to be used.

There has been desultory maintenance of the structure. Four or five years ago some of the piers had deteriorated to such an extent that upon investigation by experts the structure was declared to be in a dangerous condition. Repairs were made, large portions of some of the abutments being entirely rebuilt. Since then, and not infrequently, some member of the superstructure fails or repairs are made that temporarily suspends traffic.

On complaint made to The Public Service Commission the Peoples Bridge Company was required to employ a competent bridge expert who shall be satisfactory to the Commission, to make a thorough examination and report as to the conditions, stability and safety of the abutments, piers and superstructure. A copy of this expert's report was required to be submitted to The Public Service Commission.

4. COMMON CARRIERS.

a—GETTYSBURG PASSENGER STATION.

This matter was investigated upon complaint regarding inadequate facilities at the passenger station of the Western Maryland Railway Company at Gettysburg, Adams County, Pa.

This station is open early every morning. On the day of inspection at 6 A. M., the floors had not been swept nor the platform outside. The toilets presented a neglected appearance, the windows were not screened and the wash bowls had not been cleaned for some time. Plastering in spots had fallen down and the walls were dirty.

Running water is provided for cleansing the hands, paper is furnished as towels, there is drinking water in the waiting rooms, a telephone booth, telegram blanks and seats.

The platforms outside of the station rooms are of concrete. They were widened and extended last year to accommodate the crowds during the Fiftieth Anniversary Celebration of the Battle of Gettysburg. At one end of the platform, but back from it, there is a lavatory with nine seats on either side connected to the public sewer system and provided with running water and flush closets. This building is kept locked and is used on special occasions only.

There is no platform on the opposite side of the tracks from the station but the railroad right of way is in a public street and the buildings front on the street and there is a sort of a side walk parallel to and opposite to the station platform which is used by the owners and occupants of the buildings on that side of the street and upon which passengers may alight.

Gettysburg has a population of about 4,500 people. The station is amply commodious for a town of this size and for the excursions which are made to Gettysburg during the open season. If the company would exercise greater care in maintaining the existing station, if it first made presentable in appearance and thereafter kept clean there would be no sufficient cause for complaint relative to facilities at the station. The company was requested to put its station and entire premises in a sanitary and presentable condition, and to maintain the same in conformity with modern health regulations.

5. ELECTRIC LIGHT AND POWER PLANTS.

a—ASHLAND.

An inspection was made of the plant of the Edison Electric Illuminating Company of Ashland, Schuylkill County, which plant is now owned and operated by the Eastern Pennsylvania Light, Heat and Power Company, Pottsville, Pennsylvania.

Mr. Reed reported as follows:

Power House.

I arrived in Ashland about noon of Thursday, the 2nd inst. and after calling at the local office of the Company, inspected their power house. I found the power house located along the railroad track with handy facilities for unloading coal and consists in general of the following equipment:—

BOILERS.—Two return tubular boilers either of which can operate the entire plant. The fire under one boiler being banked and is only used when drawing the fire under the other boiler. This is a precaution not often taken by such small plants. Rice coal worth about \$1.17 per ton delivered, was being fired. Water for use in the boilers is purchased from the borough.

MACHINERY.—One Allis Corliss Valve, single cylinder non-condensing engine, direct belted to a two phase, 60 cycle, 2,300 volt, 45 ampere, 200 K. W. 600 R. P. M generator. This engine and generator is operated in the evening and whenever the load is sufficient to necessitate it.

One Buckeye engine running about 250 R. P. M. was direct belted to a 22.5 ampere, 2,300 volt, 50 K. W. two phase generator. This set is operated during the day and whenever the load is not heavy enough to necessitate the larger set.

STREET LIGHTING EQUIPMENT.—Two 7.5 ampere, 2,350 volt Adams Bagnall constant current series transformers used in connection with alternating current series arc lamps.

One 4 ampere, 5,000 volt constant current transformer and rectifier used in connection with direct current Magnitite Street Arc Lamps.

SWITCH-BOARDS.—The switch-boards were first class and the wiring good. The station is kept neat and is operated in a business like manner.

ATTENDANCE.—There were two men in attendance—one firing the boilers and oiling—the other tending the switch-board.

I was informed that two men are in attendance from 12 o'clock noon until twelve o'clock at night and one man on the other shift.

One outside repairman and lamp trimmer. One lady clerk at the office located on the main street of Ashland.

One foreman in charge of the station and equipment.

The company has construction men who work at all the various places in which they do business.

Lines.

The primary lines, transformers and most of the secondary lines for supplying commercial lighting and power are strung on poles placed in the alleys between the streets and the service is brought into the rear of the buildings, thus there are no unsightly service wires on the principal streets which usually detract from the appearance of the street. The only lighting lines on the streets being a single line for supplying street arcs, and these only on the side streets. The construction work is first class, most of it impressed me as not being more than two or three years old. The poles are set straight and guyed wherever necessary and the lines well drawn. They have erected poles and placed lines so as to be able to render service to all parts of the borough.

Borough Contract.

The town is especially well lighted, there being 56 arc lights and 58 series, 60 candlepower incandescent lamp. Their contract with the borough, which I understand, has five or six years to run yet calls for a charge of \$85.00 per lamp for the arc lamps and 9 cents per night for the incandescent lamps. The charge for the arc lamps is too high and I was informed that the company have offered to replace all of the old Adams-Bagnall street lamps with the more modern Magnetite lamps, which will give more than twice the amount of light and reduce the price from \$85.00 to \$60.00 per lamp per year, the same price they are charging elsewhere. The borough should accept this offer since it will save them \$1,400 per year and they will also probably find that they can space their lamps further apart and reduce the number necessary, thus further reducing the expense.

Amount of Business.

The company has 262 business customers,
288 residence customers,
and 12 power customers

in the borough of Ashland and surrounding territory consisting of Cunningham and Butler Township, territory in which they do not have competition.

The total output of their station for 24 hours April 2nd was 1040 K. W. hours. The load during the afternoon was about 10 K. W. and in the evening about 100 K. W. The amount of power sold in the borough of Ashland and in territory in which they do not have competition, for the past three months was as follows: January 16400.0 K. W. hours, February 14147.5 K. W. hours, March 12575.6 K. W. hours. This does not include the power used in street lighting for which they have a contract. It would appear that the amount of business in sight is rather small and it is my opinion that it would not pay another company to put up the equipment to go into competition even if they should succeed in securing the greater part of the business.

General Information.

The Eastern Pennsylvania Light, Heat and Power Company, in addition to furnishing power from this station to Ashland Borough, and certain parts of Cunningham and Butler Townships, in which they have no competition are furnishing power and light in Centralia, Gilberton and Girardville in competition with the Schuylkill Electric Company, which in addition to operating a trolley line from Ashland to Shenandoah and from Girardville to Mahanoy City and from Mahanoy City to Shenandoah also furnish electricity for lighting and power purposes in Girardville, Ashland, (four customers) Centralia, Gilberton and parts of Butler, Cunningham and Mahanoy townships.

This information was given me by Mr. T. J. McAndrews, Superintendent of the Schuylkill Electric Company, who also showed me through their power house in which I found the following equipment:

One —425 KW, DC, Railway Generator, direct connected to single cylinder Corliss engine.

One —300 KW, DC, Railway Generator and one hundred KW—1100 volt, single phase generator belted to Simple Engine.

One —250 KW, 2400 volt, 3 phase generator and one 200 KW Railway generator, belted in tandem to single cylinder Corliss engine.

One —500 KW 2400 volt, 3 phase generator direct connected to Corliss engine.

Three—150 HP Keeler Return Tubular Boilers.

Two —300 HP Keeler Water Tube Boilers.

Two —250 HP Babcock and Wilcox water tube boilers.

They have ample capacity to take care of any increase in load which might be required should they be allowed to do lighting business in the borough of Ashland, and was informed by Mr. T. R. Ettringham, foreman in charge of the interests of the Eastern Pennsylvania Light, Heat and Power Company at Ashland, that they have connected up four customers since the Commissioners issued an order restraining them from doing business in Ashland.

The switch-boards were for the most part of an old type and the power house wiring poor. A considerable portion of their line construction which I noticed in the vicinity of the power house as well as that in the borough of Centralia is far from being first class. I understand that they do not furnish polyphase current in Centralia; in other words they are not in a position to take on anything in the way of power customers except very small motors. Their power house equipment, however, is suitable and it would be only necessary to run the wires.

Rates.

Appended hereto you will find on a light blue paper the rates in force in Ashland as well as other places in which the Eastern Pennsylvania Light, Heat and Power Company do business. These were furnished me by Miss M. E. Russell, the company's lady clerk in charge of the Ashland office. I questioned her in regard to them and asked her if they charged the same rates to all the customers, making special reference to those residing within and without the competitive territory. She assured me they did, also Mr. Wm. H. Long, their contract agent, with whom I talked over the telephone, he being in Pottsville at the time, assured me that they maintained these rates wherever they do business, including the City of Pottsville.

In order to verify this, I went to Centralia, where both companies do business and made inquiry from A. D. Goldsmith, a druggist, who kindly let me see one of his receipted bills and I found it to be in accordance with the established rates.

You will also find appended herewith an application blank for power service which discloses the power rates. The lighting rates of the Schuylkill Electric Company in typewritten form are also appended. This latter sheet does not state the basis rate but it is my understanding that it is ten cents (10c.) per kilowatt hour, and under the flat rates I was informed by Mr. McAndrews previously referred to, that this means 16 candle-power carbon lamps or their equivalent or nothing above 60 watt lamps. Since meters have become so cheap there is not much excuse for having any flat rates.

There is not much difference between the rates of the two companies although the discounts allowed by the Schuylkill Electric Company increases more rapidly than those of the Eastern Pennsylvania Light, Heat and Power Company, and both companies seem to have custom in territory where they compete. There does not seem to be much sense to either company's rates, since there is no sound reason why a large consumer should be allowed a larger discount than a small one; on the other hand, the discount should be allowed for prompt payment and should be the same to all. The rate should be fixed in accordance with the consumption, taken in consideration with the demands of the customer. The rates in force by either company are about what are usually charged and it is my understanding that there are no rate complaints.

Service.

The service of the Eastern Pennsylvania Light, Heat and Power Company in Ashland, so far as I could see, was first-class, better than the average, and the entire layout is much superior than is usually found in towns of this size. Mr. Goldsmith in Centralia stated he cut off from the other company because this company gave the best service. They have a systematic method of taking care of all complaints and their trouble sheets were shown me showing that all complaints were promptly taken care of and the customers satisfied. Their plant being located near the center of the town, they have no voltage drops and since their load is steady the regulation is good.

Conclusions.

It is my opinion that the Borough of Ashland is well served by the Eastern Pennsylvania Light, Heat and Power Company; that the rates are reasonable and that any other entering the field would not be able to secure sufficient business to earn dividends on the necessary investment.

The Schuylkill Electric Company have poles on the principal street of the town but these are too low for properly supporting high tension wires, besides to bring in the same from the front of the houses would greatly mar the appearance of the street and on the other streets the equipment would have to be duplicated from the ground up.

The returns as evidenced from the amount of current sold cannot be very great and if this were greatly reduced it would not be a paying proposition, and would only result in poorer service.

I noticed entire blocks of houses in which there were no domestic customers and others in which there were only one or two customers, although the equipment was at hand to serve them. I was informed that they couldn't get the property owners to wire the houses.

It would seem to me that a town of 7,000 inhabitants having gas and electric lights could not receive any permanent benefits from a second electric light company.

For the good of both companies, I respectively advise against the granting permission to the Schuylkill Electric Company or any other company engaging in competition in the electric lighting business in the borough of Ashland.

JOHN C. REED,
Electrical Engineer.

b—EXETER.

An inspection was made of the equipment for furnishing light to the citizens of the Borough of Exeter, Luzerne County, by the Citizens Electric Illuminating Company of Pittston. This company furnishes light and power in the city of Pittston and surrounding boroughs, including West Pittston and Exeter on the opposite side of

the river from Pittston. All of the territory in this vicinity is supplied by one of three companies whose principal place of business is either Wilkes-Barre, Pittston or Scranton, there being no competition or duplicates of equipment and it would appear that there is no unserved territory as a basis for a new company.

The Borough of Exeter has 2,500 to 3,000 inhabitants and is not closely built up but is widely scattered, making it an expensive proposition for an electric lighting company.

Mr. Reed made the field investigation and he reported as follows:

The Citizens' Electric Illuminating Company has 110 customers in Exeter and it had a contract for supplying 39 street arc lamps for lighting the streets of Exeter. This contract expired several months ago and since then they have been continuing to serve the borough and are charging \$60.00 each per year for the lights, the same as is charged the City of Pittston, although they have not been paid since the first of the year owing to the fact that there are two sets of councilmen and other borough officers.

I made inquiry from a cigar dealer, as to the quality of the service, and he said it was all right and I found his bills in accordance with the established rates of the company.

The current sold exclusive of the street lighting within the borough of Exeter for the month of March, 1914, amounted to 4338 K. W. hours; this information being worked up at my request from the bills, since the Borough of Exeter and the Borough of West Pittston are carried on the same station lines. The above consumption includes five power customers, so it will be readily seen that the business is very small. The company has two phase 60 cycle current and direct current series arc circuits in the Borough.

The line construction is in good shape although not of an expensive nature. There is gas competition in the town.

There is not sufficient business in sight for another company to make a living, in fact, I doubt if it could be shown that it would be a profitable investment for a new company if they had the entire borough to themselves.

The company has a fairly modern power plant of several thousand kilowatts capacity, consisting of steam turbines, operating condensing, and was informed their capacity was twice their maximum load.

I understand there is ample evidence now before the Commissioners to prove that the service is satisfactory, nearly all their customers having signed a paper to that effect.

The Power house is located at no great distance from the borough so there should be no difficulty about the regulation with such a small load. I did not stay over night in the borough of Exeter since I did not consider it necessary.

First—In my opinion the Borough of Exeter is well served with electric light and power.

Second—That another company entering this field would not be a paying proposition.

Third—That the present company cannot be securing more than a fair price on the investment now in the Borough.

Fourth—The introduction of a second company could not result in any permanent benefit to the citizens of Exeter.

I, therefore, recommend that permission for a second company to do electric lighting business in the Borough of Exeter be refused.

JOHN C. REED,
Electrical Engineer.

c—LEBANON VALLEY ELECTRIC LIGHT COMPANY.

An inspection was made of the Lebanon Valley Electric Light Company's plant and facilities. The question up for consideration was the purchase by the Reading Transit and Light Company of the controlling right, title and interest in the said Lebanon Valley Electric Light Company.

The transmission lines and distributing system of the said Lebanon Valley Company are substantially good and serviceable, but the apparatus at the main power plant and at the auxiliary station is not worth much.

Furthermore, in order that the said company may continue its business of furnishing light and power in its present developed territory it will be necessary for it to build an entire new and up-to-date power plant involving an expenditure of \$50,000.00. This outlay would of course be a charge upon the company's consumers. The territory in and about Lebanon is not extensive enough to support two companies operating individual plants. There is no question but that the Reading Transit and Light Company is equipped and capable of furnishing satisfactory service at reasonable rates to all its territory including Lebanon and its environments. The public convenience and necessity would be subserved by the taking over of the plant and property of the said Lebanon Valley Company by the said Reading Transit Company.

Mr. John S. Weaver, the prime mover and principal owner in the incorporation of the subsidiary companies and the merger of them into the said Lebanon Valley Electric Light Company, is a citizen of North Lebanon Township and a manufacturer of bologna sausages. Several years ago he ventured into the field of public water works, and finally sold out at considerable profit. Thus encouraged he took up the proposition of furnishing electric current. He knew nothing of this business and it is evident from a physical inspection of the plant that very poor judgment was exercised. The plant has been developed in a desultory manner; second-hand apparatus has been largely used; the capacity has been inadequate at all times. An auxiliary station was finally erected at the bologna works. Naturally the result of such methods of development is an inferior and totally inadequate power plant. Nevertheless the plant is not totally valueless. It has a net earning capacity of between \$5,000.00 and \$6,000.00 per annum, which capitalized at 6% represents over \$90,000.00.

The main power station is in North Lebanon Township at the edge of Lebanon City. The auxiliary plant is a mile and a half or so distant out in the same Township at the bologna works. The original hydro-electric plant on Swatara Creek has been dismantled. There are approximately 15 miles of main transmission lines and it is

reported that there are about as many more miles of service wires. This distributing system is quite new and in a fairly good condition. The expert who examined the same for the Company has reported the cost of this portion of the plant to be as follows:

Poles, transmission lines and rights of way,.....	\$32,000 00
Street light system,	4,000 00
Transformers,	4,500 00
Meter and service connections,	3,500 00
Total,	<u>\$44,000 00</u>

Forty thousand dollars would be the present value of the distributing system, so it would appear.

The proposed purchase does not include the land, water rights and property on the Swatara Creek. The poles to this property are still standing, but the wires have been taken down for some distance towards Lebanon from the Swatara property, which was the original plant. The wires now terminate at Mountville in North Anville Township, approximately 6 miles in a straight line northwesterly from the main power plant. In an easterly direction from the main power plant the transmission wires now terminate in Myerstown Borough, 6 miles distant. The poles have been erected 3 miles beyond Myerstown to Richland Borough, but the wires have not been strung.

The apparatus and everything connected therewith at the auxiliary station, bologna factory, is to be excluded from the purchase.

At the main station there is a lot 150' long by 113' wide, which cost \$25,000.00. The building, a frame structure, 50' x 70', looks more like a shack than anything else. The lot, building and railroad siding into it, is probably worth \$3,500.00 today. The 450 foot artesian well on the premises is worth \$1,000.00; the two producer gas engines directly connected to generators, having a present value of not over \$10,500.00, although the cost set up was \$25,500.00. On this basis the present value at the main power station is \$15,000.00, added to the \$40,000.00, the distributing system, gives a present value of the entire plant of \$55,000.00. This conclusion is the result of a very hasty and general examination of the property.

There are about 400 customers. Light is sold at 50 K. W. H. net with a minimum of 75 cents per month. The power rate is 4 to 2 cents per K. W. H. net—no minimum. The transformers range from 1.5 to 30 K. W., being mostly from 2.5 to 5 K. W. in capacity. There is a total of about 750 K. W., which at \$6.00 is equivalent to \$4,500.00. Eight dollars is not an unusual figure to estimate as the value K. W. for transformers. The purchasing company proposes to pay for the property to be acquired \$41,500.00 in cash, and \$75,000.00 at face value in common stock of the stock of the Easton Power and Light Corporation. This stock is not listed, but its accepted value among owners is taken at \$20.00 per share. If the stock were listed at this rate it would be equivalent to \$15,000.00, or a total purchase price of \$56,500.00 at this time.

Conclusion.

The present investment in the plant and property of the Lebanon Valley Electric Light Company is approximately \$100,000.00. The distributing system is fairly good and may be valued at \$40,000.00; the power plant at \$15,000.00 making the present value, excluding the Swatara property and the auxiliary station plant, as \$55,000.00,

If the Lebanon Valley Electric Light Company is to continue on in business a new power plant will have to be built at an estimated cost of \$50,000.00; but there is not enough business to warrant such an expenditure on the part of this competing company. For substantially the same price, namely, \$41,500.00 in cash, the Reading Transit and Light Company with adequate plant now in operation will take over the said Lebanon Company's property and operate it.

6. WATER WORKS.

a—SUSQUEHANNA TOWNSHIP WATER COMPANY.

This case was brought up on complaint of David M. Beck against the Susquehanna Township Water Company of Dauphin County, with particular reference to the alleged inadequate service.

The conclusion of the Bureau's investigations were substantially to the effect that the water company is rendering efficient service and that the suspension of service, principally complained about, was due to a cause which is not likely to happen again. When the interruption to service may be remedied by the company where application is made properly to the Company, it is not the proper procedure, in neglecting to so notify the Company, to bring the complaint before the Public Service Commission. Accidents such as breaks in water pipes, followed by temporary suspension of service during repairs, are not sufficient cause for complaint to the Public Service Commission ordinarily. These necessary interruptions daily aggregate throughout Pennsylvania many scores no doubt. They are incident to the management of a water works system, even where the system is new, as in the case at hand.

The complainant resides near the City of Harrisburg line and draws water from a distributing pipe of the Susquehanna Township Water Company at or near the end of this pipe. In consequence, there is more likelihood of entrained air appearing in the water drawn from the pipe. The water company represents that if it becomes necessary, the company will install a blow-off on said pipe to reduce the air in the water to a minimum.

The rates charged for water are less in Susquehanna Township and vicinity than elsewhere in the districts supplied by the Paxtang Consolidated Water Company, which is the main holding and operating company.

About six years ago, the only corporation that supplied water to the public in Susquehanna and Swatara townships, in which townships are the suburbs of Harrisburg, was the Paxtang Water

Company. Its charter was limited to Paxtang village in Swatara Township. The source of supply was drilled wells and the service was inadequate. At that time the Borough of Hummelstown was supplied with water by the Hummelstown Light, Heat and Power Company. The service was unsatisfactory. The Borough of Middletown and vicinity was supplied with water by the Middletown Water Company and the service was unsatisfactory. The State Department of Health took action relative to these three water works systems and improvements had to be inaugurated. Harrisburg's suburbs were growing rapidly and needed public water. A charter had been granted to the Penbrook Water Company for the Borough of Penbrook and to the Progress Water Company for the Township of Susquehanna, but there was no place where a source of supply could be obtained except along the Swatara Creek. This was also true with respect to the Rutherford Heights Water Supply Company, chartered for Susquehanna Township.

The State Departments of Health and Water Supply encouraged the reorganization and consolidation of these companies in order that there might be created a district large enough to warrant the construction of one adequate water works system and in consequence names were changed as hereinafter explained and the Paxtang Consolidated Water Company came into existence as a holding, operating company. It also acquired the controlling interest in the Middletown Water Company, but since there is no physical connection between the Middletown plant and the Susquehanna Township Water Company case, it need not be further mentioned.

The Hummelstown Light, Heat and Power Company changed its name to the Hummelstown Consolidated Water Company. This company built a modern filtration plant, approved by the State Department of Health and operated to its satisfaction. This company today owns this filtration plant, the dam on the Swatara River, the power station and equipment. It supplies power and light and water to Hummelstown Borough. Also it supplies power and water to the Rutherford Heights Water Supply Co. Since the reconstruction of the works, the service has been most excellent in Hummelstown.

There is a minimum meter rate of \$10 per annum and 20 cents per thousand gallons. There are, however, not over twenty meters in the borough. The lowest flat rate is \$6.50 per annum. Water is furnished for fire purposes and domestic use.

In connection with the filter plant, there are duplicate raw water pumps of two million gallons capacity, and a third unit of the same size is being put in. The output at the station averages 1,250,000 gallons per 24 hours. This is the total consumption of all of the water companies mentioned with the exception of the Middletown plant which has no physical connection.

The Rutherford Heights Water Supply Company has installed in the Hummelstown station a 2,000,000 gallon steam pump, a million gallon pump water driven by power from the dam and a million gallon electric driven pump. The filtered water is pumped to Chapman Hill through a 12-inch pipe 5 miles long. This reservoir is circular, covered, re-inforced concrete construction, having a capacity of 1,100,000 gallons. From it water is delivered by gravity through a 12-inch pipe laid along the Hummelstown turnpike to the City of Harrisburg line, a distance of three miles. This pipe passes through Paxtang village.

In Swatara Township is the village of Rutherford Heights and the freight yards of the P. & R. Railway. This Railway Company purchases about 250,000 gallons daily from the water company. The Rutherford Heights Water Supply Company owns the reservoir and pipe lines, excluding those in the village of Paxtang. The water is all purchased on a flat rate basis, \$6.50 being the minimum rate. The minimum meter rate is \$12. per annum. The charge for water is 30 cents per thousand gallons. The Railroad pays 4 cents per thousand gallons.

The Paxtang Water Company changed its name to the Paxtang Consolidated Water Company. It owns the distributing pipes in its charter territory of Paxtang village in Swatara Townships. This is a first class township. The Commissioners thereof have not established fire hydrants service. The fire hydrants have been erected by the company but they are used only as blow-offs. The rates of this company are the same as in the other portion of Swatara Township. Paxtang Consolidated Water Company buys its water of the Rutherford Heights Water Supply Company. This company supplies the public in the trolley park. Mrs. H. F. Kramer was interviewed in her husband's store in Paxtang. She said that the water service was excellent in all respects. At the P. & R. Y. M. C. A. and at Rutherford Heights store similar statements were made as to service.

The Susquehanna Township Water Company is chartered for the entire township. It buys water of the Rutherford Heights Water Supply Company and sells to the Extension Water Company of Penbrook, originally the Penbrook Water Company of Penbrook Borough. Susquehanna Township Water Company was originally the Progress Water Company. It supplies the State Hospital in the suburbs of Harrisburg with 300,000 gallons of water daily. The Superintendent, Dr. Orth, has designated an attendant to take charge of the Institution's water works. This attendant is instructed to blow off the water pipes every month or so. It happened that during the time the 48 hour interruption in service is alleged to have

occurred by the complainant Beck, that this attendant opened up the blow-off at the hospital and entirely forget to close it, resulting in the emptying of the reservoir seven miles distant. It is not likely that he will do this again, but of course it is possible.

Edward Hoffnagle, Postmaster of Penbrook Borough, stated when asked, that the water service in Penbrook is excellent in the main and the public has no reason to complain, so far as he knows.

Because the original Progress Water Company and the original Penbrook Water Company fixed in their franchise a minimum meter rate of \$8. per annum and 30 cents per thousand gallons with a flat rate of \$6. for single spigot, the Susquehanna Township Water Company and the Extension Water Company of Penbrook now maintain these rates, although they are lower than the rates charged by the Paxtang Consolidated Water Company, the Rutherford Heights Water Supply Company or the Hummelstown Consolidated Water Company.

Fire service is afforded in Penbrook. At the hospital the charge for water is 4 cents per thousand gallons.

In the village of Progress, Susquehanna Township, at Hotel Progress, the man interviewed reported that the service was good but that there was some complaint about air in the water. This is due to the service main being a dead end. Possibly the air valves do not work to the best advantage. The company uses the hydrants along the streets with which to blow off the air when there is undue complaint.

Mr. Beck's principal complaint is that the company shuts off water without due warning to the consumers; also that there is no local agent of the company nor is the office of the company open at night so that in case of suspension of service, the consumers have nowhere to go for information or to whom an accident or break can be reported until the next morning; that during office hours, the company's agents in charge at the office in the Commonwealth Trust Building, Harrisburg, oft times give facetious answers or misleading information to 'phone inquiries.

The complainants Beck, Lumb, Smith and Hetrick, whose houses are on the highway in the rear of which is the public park and golf course, most earnestly covet and desire the City of Harrisburg water, which extends practically to their back doors. It is significant that nowhere else throughout the very extensive district of the operating company has there developed or could be found remonstrance to the service rendered, but to the contrary, the service is commended.

Conclusions.

1. That the water company only shall operate the blow-off at the State Hospital.

2. That the water company shall not supply to the P. & R. Railroad at any time a volume of water in excess of that which can be supplied and at the same time maintain a continuous and satisfactory service in the water district beyond.

3. Mr. Wagoner & Son, Plumbers, of Penbrook Borough, are the local representatives of the company in that neighborhood, so it is stated by C. E. Schaup, Engineer of the Paxtang Consolidated Water Company; but it appears that the consumers do not understand this. The company should maintain locally, after establishing either at the office of the said Wagoner & Son, or elsewhere, a company 'phone, a satisfactory information bureau for the benefit of the consumers there not only during the day time but for emergencies at night. Furthermore, the department of the company's agents in the general office at the Commonwealth Trust Building should be such with respect to answer to consumers, whose service is interrupted, as to obviate any basis for complaint as to inattention and lack of courteous treatment. All complaints of a local nature should be properly made to the company and the company must be bound to properly act on such complaint.

4. The water company should be careful to notify its consumers of any intended and necessary interruptions in the service, or in case of accident, to promptly inform the consumers affected of the nature thereof and the probable extent of the interruption in the service.

5. The air valves on the distributing system should be examined frequently and be kept in working condition. If it be feasible at the end of the pipe from which the complainant draws the water, for a connection to be made with the City of Harrisburg water works system, so as to temporarily feed city water into this portion of the company's pipe line during such times as a temporary interruption in the company's service may occur. This should be done.

7. JACKS.

In the operation of electric railways—urban and suburban—derailments and more serious accidents in which other vehicles or human beings become lodged under the car are bound to occur from time to time. If the accident is a derailment, it is essential in the interest of good service to get the car back on the track as quickly as possible. If it happens that an unfortunate human has become jammed under the car or the car wheels, his rapid removal from the position will enable him to receive so much sooner the proper medical

aid that may reduce very much the seriousness of the injury, or that may even mean the difference between a serious and a fatal occurrence. In response to a rapidly crystalizing public sentiment in favor of some measure that would ensure prompter and more effective measures, particularly in accident cases involving injury to life and limb, the Public Service Commission held a hearing on May 7th, 1914, at which hearing interested parties were invited to present their views. On May 21st, 1914, the Commission issued General Order No. 10, calling for the equipment of all street railway cars with suitable jacks.

THE PUBLIC SERVICE COMMISSION OF THE COMMONWEALTH OF PENNSYLVANIA.

At a meeting of The Public Service Commission of the Commonwealth of Pennsylvania, held at its office in the City of Harrisburg, Pennsylvania, on the twenty-first day of May, 1914.

PRESENT:

S. LA RUE TONE,
 SAMUEL W. PENNYPACKER,
 EMORY R. JOHNSON,
 MILTON J. BRECHT,
 CHARLES F. WRIGHT,
 FRANK M. WALLACE, Acting Chairman,
Commissioners.

GENERAL ORDER NO 10.

In the matter of installing Jacks on the Cars of Street Railway Companies.

AND NOW, May 21st, 1914, it is ordered that each street railway car, engaged daily in operating service upon the surface of streets and highways within this State, be equipped with a jack of a lifting capacity sufficient to raise one-quarter of the total weight of a double truck car and one-half of the total weight of a single truck car at least eight inches.

It is further ordered that one-half of the cars of each street railway company be equipped in the manner as above described on or before December 1st, 1914, and that every car included in the provisions of this order be equipped on or before June 1st, 1915.

BY THE COMMISSION:

A. B. MILLAR,
Secretary.

The investigation of the question by the Chief of the Engineering Bureau and the testimony presented at the hearing developed information that should prove of general value and interest, and hence is included in this report.

Some of the street railway officials present at the hearing expressed the opinion that the demand for jacks on each car was based more largely on sentimental than on practical considerations and that the effectiveness of a single jack in the hands of untrained and partly trained men in conserving life or reducing the severity of injury to the victim was open to doubt. They recognized the growth of public demand in the matter, believed it would be wise to yield to the demand, and were also anxious to co-operate with the Commission in improving service and general conditions. The representatives of the traction interests in Philadelphia considered their system of nine emergency districts and twenty-eight emergency vehicles, a system that enables them to place a vehicle carrying a complete outfit of wrecking equipment and a crew of trained men at the scene of an accident in the central sections of their system in from three to five minutes, as offering much more positive and effective relief. The question of jacks had been taken up with them by the Civic Club, an organization of women, and they had made an exhaustive study of the question in relation to their equipment, resulting in the design of a special jack which they considered very satisfactory.

A general discussion concerning the approval of certain makes and types of jacks by the Commission led to the conclusion that specification of the lift and of the lifting capacity in terms of the weight of the car to be handled was the rational solution of the problem. The action of the Commission was in accord with this thought. The character of the equipment and the nature of the roadbed would naturally affect the type of jack selected in any particular case. In Philadelphia, for example, the near side cars are equipped with a rubber sheathed board placed just before the truck to act as a secondary fender, making it necessary to develop a special form of jack that would enable a grip to be obtained upon the truck frame. It is also obvious that the conditions on a suburban road equipped with a "T" rail might require a different form of jack and a slightly higher lift than would be required for use on girder rail construction in paved streets.

The first requirements of a suitable jack are effective lift and lifting capacity, combined with general features adapted to the character of the rolling stock and to the nature of the roadbed. The jack should possess flexibility of application in order to be usable in close quarters, without blocking if possible, a requirement that may be met by a movable jaw on a swivel head or its equivalent, and by a short working lever and a short working stroke. Furthermore, the construction of the jaw must meet any special requirements imposed by the construction of the truck or of the car. The jack should be simple in its construction and its operation, and

should give its lifting capacity with minimum requirements of force applied consistant with reasonable speeds of lifting. Lightness of construction consistent with a strength will increase ease of handling and also reduce the yearly charge for weight carried on the car. The jack that can be handled and worked by one man will surely be better suited to this work than will the jack requiring two men for its handling or its working. Strength and ruggedness of construction—although opposed to lightness—are necessary factors to be considered in the selection of a jack, as a jack must stand up under repeated use, and even under abuse, and must always be ready for service. It must be absolutely reliable. As lowering a load is often as important as raising it, the construction governing this function is worthy of careful study.

Accompanying Figures No. 1 and No. 2 show the application of jacks to the lifting of the end of a car and to the raising of a car truck respectively, and also illustrate the structural difference between geared jacks and jacks of the hydraulic type.

8. RAILROAD AND RAILWAY CROSSINGS.

A-1. IN GENERAL.

Up to the end of the fiscal year, the Engineering Bureau has examined and prepared reports on 171 railroad and railway crossings. 123 of these 171 crossings were required by the plans approved by the Commission to be carried over or under the railroad or railway—78 crossings being eliminated at grade and 45 grade crossings being avoided by new work. 47 grade crossings were approved, 10 of which involved street railways and public highways, one was a freight siding, one was a temporary grade crossing and 35 were permanent steam railroad crossings. One grade crossing asked for was denied and the petitioners concluded to give up the idea of any crossing whatsoever at the street in question.

The statement in tabular form is as follows:

Grade Crossings Approved:	
Freight Siding,	1
Temporary,	1
Street Railway,	10
Steam Railroad,	35
Total grade crossings approved,	

Grade Crossings Eliminated:

Existing crossing done away with,	78
Avoided by new work,	45
	<hr/>
Total grade crossings avoided,	123
Asked for and no kind of crossing approved,	1
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Total,	171
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In the following pages will be found a description of these crossings, excepting those in South Philadelphia, which may be found under the section of this report dealing with the improvements of the Port of Philadelphia.

A-2. PHILADELPHIA.

In Philadelphia very extensive work has been done in the years past in the matter of eliminating and avoiding grade crossings. Many of the problems were met and solved at a time when the requirements for safety were not as exacting as at the present time. It will appear in connection with Reed and 71st Streets and Glenwood and Warrington Avenues, that the Public Service Commission has had to be governed somewhat in its decision relative to the plans for avoiding grade crossings at these points by what has been done in the past.

a—Reed Street Foot Bridge—Philadelphia.

Over the Tracks of the Baltimore & Ohio Railroad.

Reed Street is in South Philadelphia. It extends from the Schuylkill River to the Delaware River. There is a small section of the land thoroughly built up south of Grays Ferry Avenue and lying between the Schuylkill River and the Baltimore & Ohio Railroad in which Reed Street is built up; but this section of Reed Street has not been physically connected with the section of Reed Street east of said B. & O. Railroad. The public traffic has never amounted to enough in this small west section to demand the building of a highway bridge over the railroad tracks at Reed Street but there is a demand and sufficient warrant for a bridge for pedestrians and such a structure the City now purposes to provide.

The Baltimore and Ohio Railroad connects with the Philadelphia and Reading Railway in the vicinity of Girard Avenue near North Philadelphia. For the purposes of this report the discussion will be confined to that portion of the line of the B. & O. from Market Street south. Beginning at Market Street, the B. & O. Railroad follows down the east bank of the Schuylkill River through the passenger station in the city block between Chestnut and Walnut streets, thence under South Street and under the Delaware Extension of the Pennsylvania Railroad, and thence by tunnel under Grays Ferry Avenue and P. B. & W. Railroad and under a highway bridge at Wharton Street, and thence passing Reed Street where as hereinbefore stated there is no physical crossing, and over the Schuylkill Avenue and the Schuylkill River

into West Philadelphia and thence in a southerly direction into Delaware County. Beginning at Reed Street and extending southerly along the east bank of the Schuylkill River are the freight and storage yards and extensive repair shops of the B. & O. Railroad. Along the line described from Market Street to the Delaware County Line, there are in the City 13 highway crossings, 3 railroad crossings and the proposed foot bridge crossing. A tabular statement with respect to these crossings follows:

Number.	Crossing.	Baltimore and Ohio Railroad passes under.		No. tracks bridged over.
		Overhead structure.	Vertical clearance.	
1	Market St.,	Deck girder,	Ft. 15.83	2
2	Chestnut St.,	Viaduct,	20.50	2
3	Walnut St.,	Viaduct,	20.17	6
4	South St.,	Steel Truss,	22.67	4
5	P. R. R. De. Ex. Br.,	Steel Truss,	18.33	4
6	Grays Ferry Ave.,	Tunnel,	17.25	2
7	P. B. & W. R. R.,	Tunnel,	17.25	2
8	Wharton St.,	Girder,	18.00	4
9	Reed St. (foot bridge),	Steel Truss,	20.5	8
10	Schuylkill Ave.,	(R. R. over), .....	.....	.....
11	Gibson Ave.,	Girder,	18.00	2
12	P. B. & W. R. R.,	Truss,	18.00	6
13	Grays Ave.,	(R. R. over), .....	.....	2
14	Woodland Ave.,	Girder,	17.21	4
15	61st St.,	Girder,	17.00	4
16	Cemetery Lane,	Wood, .....	.....	2
17	65th St.,	Girder,	18.4	2

It will be observed that only one of all the bridges given in the above table affords a clearance between the tracks and the bridges of over 20.5 feet, which is the head room proposed at the foot bridge. Furthermore, the clearance over rails at the proposed Reed Street foot bridge is to range from the minimum of 20.5 feet to the maximum of 21.8 feet, which clearance is satisfactory to the railroad company. The detail plans have been approved by the chief engineer of the railroad and by the proper city officials.

The bridge is to be 8 feet wide in the clear and to have a span of 174 feet. The estimated cost is \$12,500, all of which expenses is to be assumed by the city.

The plans were approved with this modification, namely that the vertical clearance should not be less than 21.8 feet. If greater clearances than those now provided along the line of the railroad and shown in the above table are ever required, it will necessitate extended changes in the railroad all along the line and the work would have to be done all at one time.

b—71st Street Bridge—Philadelphia.

Over the Tracks of the Philadelphia, Baltimore and Washington Railroad.

Seventy-first Street is in West Philadelphia and extends from Cobbs Creek—the Delaware County Line—in a general easterly direction to the marshes along the Schuylkill River.

The Philadelphia, Baltimore and Washington Railroad primarily started in South Philadelphia, at the corner of Broad Street and Washington Avenue, and extended westward across the Schuylkill River near Grays Ferry Avenue and thence in a southerly direction through West Philadelphia into Delaware County. Now, there is a branch line near Grays Ferry Avenue, (which branch line is the main line as the railroad is operated) that continues northerly along the west bank of the

Schuylkill River from near Grays Ferry Avenue to the station in West Philadelphia at Market Street. This connecting line comprises a part of the Central Division of the said P. B. & W. Railroad—a part of the Pennsylvania Railroad System.

On the P. B. & W. main line from West Philadelphia station to Cobbs Creek there are 18 public highway crossings in the city. A tabular statement with respect to these crossings named in order from the station follows:

Number.	Crossing.	Pennsylvania Railroad passes under.		No. tracks bridged over.
		Overhead structure.	Vertical clearance.	
1	Market St.,	Tunnel,	Ft. 13.92	2
2	Chestnut St.,	Tunnel,	13.92	2
3	Walnut St.,	Viaduct,	24.88	2
4	Walnut St. in yards,	Viaduct,	15.21	8
5	South St.,	Viaduct,	18.00	8
6	Grays Ferry Ave.,	Viaduct,	19.69	17
7	49th St.,	Steel girder,	19.50	.....
8	49th St. in yards,	Steel girder,	18.00	.....
9	B. & O. R. R.,	Steel Truss,	18.00	6
10	54th St.,	Steel girder,	24.30	6
11	58th St.,	Steel girder,	20.00	6
12	60th St.,	Steel girder,	18.08	4
13	62nd St.,	Steel girder,	20.08	4
14	63rd St.,	Steel girder, .....	.....	4
15	65th St.,	Steel girder,	19.84	4
16	67th St.,	Steel girder,	20.00	4
17	71st St.,	Steel girder,	18.70	4
18	72nd St.,	Steel girder,	19.45	4

It will be observed that there are a number of bridges over the Pennsylvania Railroad along the line under discussion which provide a vertical clearance from the lowest part of the bridge to the top of the rails of the tracks beneath of 18 feet or under.

For over a year, traffic across the 71st street highway bridge over the Pennsylvania Railroad has been discontinued owing to the unsafe condition of the structure. The proposed new bridge is to replace the old wooden one. The new bridge is to be a steel through-girder structure. The steel work is to be encased in concrete. The vertical head room between the tracks and the bridge above is to be 18.07 feet. The street approaches and the connecting streets are all established at grade, and on the west side of the railroad they are surfaced with brick or asphalt and the land is quite thoroughly occupied by dwellings. The approach from the west from Paschall Avenue is on a 4 per cent. grade ascending; and from the east beginning at Grays Avenue the grade ascends on a 3.83 per cent. grade. The existing abutments of the old bridge are in good condition and will be used for the new structure, as well as the existing piers. The foundations of the abutments and piers are so built as to provide in the future for four additional railroad tracks under the bridge.

It is feasible in case it becomes necessary, for any reason, to increase the existing vertical clearances at the several bridges hereinbefore mentioned, to lower the roadbed of the railroad. To gain increased headroom by elevating the highways would involve heavy damages to abutting property. Grades would have to be reestablished, permanent pavements and sidewalks would have to be changed, entrances to buildings would have to be altered and the public would be much more inconvenienced in this manner than by changes in the grade of the railroad.

The proposed bridge is of the design in general use by the City for similar crossings and it is approved by the Chief Engineer of the Railroad and the proper city officials.

The estimated cost and expense of the erection of the said bridge is \$24,000, all to be borne by the City.

The total width of the bridge is to be 63 feet and the total length between face of abutments, 122 feet. It would seem that practical considerations limit the clearance for the present to that proposed and that the way to get more headroom in the future will be to lower the railroad; but this will involve changes in the tracks at more than one crossing.

The plans were approved.

c—Glenwood Avenue Bridge—Philadelphia.

Over the Philadelphia and Reading Railway.

Glenwood Avenue is an important thoroughfare laid out to extend from East Park on the Schuylkill River, northerly parallel to and just east of the Pennsylvania Railroad—main line to New York—through North Philadelphia.

The Richmond Branch of the Philadelphia and Reading Railway begins at the terminal facilities of said railway company on the Delaware River at Port Richmond, in the 25th and 31st Wards and thence it extends northwesterly to near Wayne Junction and thence southwesterly to and crossing the Schuylkill River and thence northerly along the west bank of the river towards Reading. The line was constructed many years ago when the country through which it passes was sparsely settled. Now it has become thoroughly built up for most part. There are along said line in the City 28 crossings. Data regarding these crossings is given in the following tabular statement:

Number.	Crossing.	Philadelphia & Reading Railway.		No. tracks bridged over.
		Overhead structure.	Vertical clearance.	
1	City Line,	Viaduct, .....	.....	.....
2	Norristown Br. P. & R. Ry.,	Truss,	23.88	3
3	Fox St.,	Arch,	*16.00	2
4	Stokley St.,	Girder,	16.00	2
5	Chestnut Hill Br. P. R. R.,	Steel,	22.79	4
6	Wissabickon Ave.,	Girder,	16.0	4
7	Blahon St.,	Foot bridge,	20.00	6
8	Germantown Br. P. & R. R.,	Steel,	17.58	4
9	Clarissa St.,	Girder,	16.00	4
10	Germantown Ave.,	Wooden,	18.00	2
11	Hunting Park Ave.,	Girder,	16.00	2
12	Broad St.,	Girder,	16.00	2
13	York Road,	Girder,	16.17	4
14	Erie Ave.,	Girder,	16.00	4
15	Venango St.,	Grade, .....	.....	.....
16	Rising Sun Ave.,	(R. R. over St.), .....	.....	.....
17	Tioga St.,	Grade, .....	.....	.....
18	Ontario St.,	(R. R. over St.), .....	.....	.....
19	Sedgley Ave.,	Girder,	16.00	3
20	Connecting Br. P. R. R.,	Steel,	16.65	4
21	Glenwood Ave.,	Girder,	16.00	4
22	6th & Allegheny,	Girder,	18.60	4
23	5th St.,	Girder,	18.00	4
24	N. Penn Br. P. & R. R.,	Truss,	15.67	8
25	Second St.,	Girder,	18.50	8
26	Front St.,	Girder,	15.20	4
27	Cambria St.,	(Proposed),	16.00	13
28	Somerset St.,	Truss,	16.66	7

*Outer rail.

All the other streets to the Delaware River pass under the railroad. Extensive abolition of grade crossings just completed through Kensington.

The territory all around the proposed crossing at Glenwood Avenue is thoroughly built up and occupied by factories and dwellings. Streets are paved at established grades and they are opened and in use up to the railroad location on both sides.

The proposed highway bridge is to be a steel through girder encased in concrete with a longitudinal span between the abutments of 56 feet and a width of 60 feet over all.

The plans have been approved by the chief engineer of the railway company and by the proper city officials. The estimated cost and expense of erecting the bridge is \$40,000, all to be borne by the city.

The proposed headroom of 16 feet, it will be noted by reference to the above table, is the same as that at 10 of the existing crossings. It would appear to be impracticable to increase this headroom at Glenwood Avenue by elevating the street higher than it is proposed to elevate it. The west approach as now planned involves no change in the grade of the street nor the buildings and pavements. This existing grade in Glenwood Avenue is 6 per cent. To carry the bridge higher than proposed will involve a large additional expense including damages to the property. Furthermore, when it shall appear to be necessary to obtain more than 16 foot headroom between the underside of the bridge and Glenwood Avenue and the top of the rail underneath, it will also have become necessary that more headroom than now exists shall be obtained at the other crossings hereinbefore enumerated. At all of the said crossings with an exception or two, and in the vicinity the property developments are complete and hence to change and elevate the established street grade with all that this means would not only involve an enormous outlay of money but it would be a positive detriment to the highway traffic. Besides, the elevation of the streets is unnecessary. The railroad tracks can be lowered no doubt at much less expense.

In view of the foregoing considerations, the abutments of the proposed Glenwood avenue bridge should be carried down deep enough to permit of the lowering of the railroad tracks.

The Richmond Branch was built years before the expansion of the City made the present number of crossings necessary. From somewhere near Germantown Avenue, where the summit of the railroad is, the grade to the Delaware River is uniform and 0.66 per cent. On this grade it is possible for a locomotive to draw from the river up to the summit a train of as many light cars as a locomotive will handle heavily loaded cars on the down grade to the river. Hence the company will not readily assent to a change in this grade and it will probably be some time before either the city or the railway company will raise the issue before the Public Service Commission as to a safe headroom for bridges over the tracks along this line.

d—Warrington Avenue Foot Bridge, Philadelphia.

Over the Philadelphia and Baltimore Central Railroad—Pennsylvania Railroad System.

Warrington Avenue is in West Philadelphia and extends from Cobbs Creek northerly to Baltimore Avenue.

The Philadelphia and Baltimore Central Railroad begins, for the purpose of this report, at the West Philadelphia passenger station on Market street, extends southerly along the west bank of the Schuylkill River to near Grays Ferry Avenue, where it deflects to the west and extends across the city and out into Delaware County, passing there through Yeadon and Lansdowne Boroughs on its way to Baltimore.

The part of this railroad extending from West Philadelphia to near Grays Ferry Avenue is along the main line of the Pennsylvania Railroad system from Philadelphia to Washington. From this passenger station to Cobbs Creek, along the Central Railroad Branch, there are 17 crossings in the City. A tabular statement with respect to these crossings and clearances follows:

Number.	Crossing.	Pennsylvania Railroad passes under.		No. tracks bridged over.
		Overhead structure.	Vertical clearance.	
			Ft.	
1	Market St.,	Tunnel,	13.92	2
2	Chestnut St.,	Tunnel,	13.92	2
3	Walnut St.,	Viaduct,	24.88	2
4	Walnut in yards,	Viaduct,	15.21	2
5	South St.,	Viaduct,	18.00	2
6	47th St.,	Girder, .....	.....	2
7	Woodland Ave.,	Girder,	16.35	2
8	Kingsessing Ave.,	Foot bridge,	16.75	2
9	49th St.,	Girder,	16.60	2
10	Chester Ave.,	Girder,	16.25	2
11	Springfield Ave.,	(R. R. over St.), .....	.....	.....
12	Warrington Ave.,	Foot bridge,	16.25	2
13	52nd St.,	Girder,	17.00	2
14	Thomas Ave.,	Concrete arch,	*16.00	2
15	55th Ave.,	(R. R. over St.), .....	.....	.....
16	57th St.,	Steel,	20.00	2
17	58th St.,	Concrete arch,	*16.00	.....

*Outer rail.

It will be observed that there are 7 bridges with a head room of 16.25 feet or less, and that the head room at all of the bridges, with one exception, along the Central Division, is below standard.

Warrington Avenue is paved and grades permanently established. The land is all occupied by dwellings and these developments have been improved with respect to street grades and house lot elevations, in conformity with an agreement between the city and the Railroad Company, signed in 1894, the Railroad Company then agreeing to lower its tracks whenever more clearance shall be needed than existed at bridges over the railroad at that time and as shown in the above table.

At Warrington Avenue the amount of this proposed lowering is 4.5 feet. Therefore, while the present proposed head room is to be 16.25 feet only, the ultimate clearance will be 20.75 feet.

At and along most all of the crossings the property in the vicinity thereof has been improved by the erection of buildings and the permanent paving of the streets. The span of the bridges between abutments provides ultimately for 4 parallel tracks. To increase the vertical clearance by raising the street grades would very extensively inconvenience the public by changing established conditions under which improvements were made and by increasing the steepness of the approaches to the bridges over the railroad, thus putting for all time a burden on the highway traffic. This is not necessary because it is practicable by the lowering of the railroad, at less cost than to change the highway grades, to increase the head room to the neighborhood of 20 feet as originally contemplated in the said agreement of July 18, 1894.

The proposed foot bridge at Warrington Avenue is approved by the chief engineer of the railroad and the proper city officials. The estimated cost of the bridge is \$6,000, and the cost of damages to property \$2,000, all of which is to be assumed by the City. The width of the foot bridge is to be 6 feet and its total span 62 feet. The steps and landings are arranged in such a way that it is not practicable at this time with the use of the ordinary riser to obtain a greater height of the bridge above the tracks and keep the landings on the sidewalks.

The plans were approved.

The increasing of vertical clearance along this line of railroad in Philadelphia will be a problem in itself sometime and whatever changes are decided upon they will naturally be done as a single piece of work.

e—Delaware Avenue Grade Crossing, at Pier No. 40, Philadelphia.

The City of Philadelphia is erecting Pier No. 40, South Wharves from the bulk head line at Delaware Avenue to the pier head line; this is near Queen Street. Delaware Avenue is the thoroughfare which parallels the Delaware River, and by means of which all traffic is carried to and from the docks, wharves and piers located on said river for the greater portion of its length in the city. On the easterly side of this thoroughfare are the said wharves, etc., and on the westerly side are warehouses and places of business such as may be found along the water front of a great sea port. In the middle of the thoroughfare running lengthwise thereof are the tracks of the Delaware Extension of the Pennsylvania Railroad Company. This company constructed the tracks and operates the same under an agreement with the Philadelphia Belt Line Railroad Company (a quasi municipal railroad) to handle the latter's traffic and that of all other traffic consigned through the said belt line. This belt line right of way begins northerly at the Point Richmond freight yards and tracks of the Reading Railway Company, and it extends southerly in Delaware Avenue and along the lower part at considerable distance south of Queen Street. There are approximately 200 sidings from said Pennsylvania Railroad tracks into the wharves, docks and piers and the said warehouses, etc. These sidings are all necessary, and ultimately the street traffic may become so congested that Delaware Avenue may have to be widened or the railroads elevated, or some other arrangement therefor to provide for public necessities on the thoroughfare. However for the present it is impracticable on account of the expense involved to offer other than sidings which must cross the avenue at grade from railroad tracks in the centre.

Pier No. 40 must have a connection with the said railroads in order to accommodate the business for which the pier is constructed. The Public Service Commission approved the proposed siding at grade into the pier.

f—Westmoreland Street Crossing, Philadelphia.

The Philadelphia and Trenton Branch of the Pennsylvania Railroad is the one involved in this petition. It starts at Kensington Station in the 19th ward and extends northerly to Tioga Street freight station in the 45th ward; thence it continues northerly to Frankford, connecting here with what is known as the main line to Trenton and New York.

The Tioga freight station is east of the railroad and on Witte Street (which is parallel to and 200 feet from the said railroad) the freight yards lying between Westmoreland Street on the south and Ontario Street on the north. The three main running tracks of the railroad are elevated and carried over said Ontario and Westmoreland Streets and over Willard Street beyond by suitable and permanent steel bridges, the tracks in between being supported on earthen embankment.

It is proposed by the railroad company to build another siding at grade across Westmoreland Street immediately east of the bridge abutments, this siding to be a spur from the main siding which now comes down from the railroad into Westmoreland Street; thence the new siding is to continue southerly along the foot of the earth embankment of the main railroad and on land of the railroad company to Willard Street and across Willard Street at grade to and onto land of William E. Cooper, one of the petitioners.

Willard Street is not opened and paved under the railroad and beyond to Witte Street and up Wittee Street to Westmoreland, or if opened the streets are not improved; but they will be no doubt most anytime.

The city has by ordinance, approved on the 31st day of December, 1913, authorized the railroad company to lay and maintain the said siding across Westmoreland and Willard Streets. There is a provision in said ordinance as follows:

"PROVIDED, That said siding be removed at any time upon the passage by councils of an ordinance to that effect without any recourse against the City of Philadelphia for damages, either property, personal or otherwise."

The Public Service Commission withheld approval of the proposed siding.

A-3—CROSSINGS OF THE PITTSBURGH, BESSEMER AND LAKE ERIE RAILROAD AND PUBLIC HIGHWAYS IN ALLEGHENY AND BUTLER COUNTIES.

The said Pittsburgh, Bessemer and Lake Erie Railroad is straightening and otherwise improving its main line in West Deer Township, Allegheny County, and in Clinton Township, Butler County. In connection with the changes incident to the work, an agreement has been reached between the said Company and Clinton Township, and between the said Company and West Deer Township.

a—Culmerville Road Crossing, West Deer Township.

The Culmerville-Butler Road is a public highway passing southerly up the valley of a small tributary of Bull Creek to Culmerville Village. This portion is a section only of the through highway from Butler on the north to the towns along the Allegheny River on the south.

Just north of Culmerville the said line of this railroad is to be deflected to the right, and a new road bed will be constructed for a distance of about a mile and a half. Where the new line begins to deflect, there is at present a crossing under the railroad of the said public highway, which highway then deflects to the west and follows closely the railroad northerly. It becomes necessary, according to the plan for the new railroad, to cross the said highway at a point about 600 feet northerly of the existing under pass. In other words, it is proposed that the new highway shall parallel the railroad as reconstructed, and be west of it for several miles, with the exception of a length not exceeding 1,000 feet where the highway will cross under the railroad to the other side by a new under pass, and thence back again to the west side by the existing under pass.

The Railroad Company is planning to construct a proposed new crossing for a four-track 60 foot steel girder span bridge of the deck type. The highway underneath will have a width of 26 feet and a vertical clearance of 14 feet. At present two tracks only will be built. In carrying out this plan, it is necessary that the highway should be moved over to the east, and this change the railroad company will make.

b—Millerstown Crossing, West Deer Township.

As previously stated, on the main line of the Pittsburgh, Bessemer and Lake Erie Railroad, in West Deer Township, and extending over into Clinton Township, Butler County, there are changes in alignment, and other improvements being made for a distance of a mile. New tracks are being carried to the east of the old tracks, and it is necessary to cross the old highway known as Millerstown Road, which connects the Kittanning Road on the west and the Tarentum Road on the east. This connecting highway is about one-half mile long. Instead of crossing the grade, the Railroad Company proposes to pass over this highway, and to change its location, moving the public road further north, and shortening and straightening the length of said road.

The proposed bridge supporting the railroad over the Millerstown Road is to be a masonry arch structure 26 feet horizontal clearance and 16 feet vertical clearance at point on 6 feet on either side of the centre of the roadway. The entire length of the barrel of the arch will be 310 feet. The highway approaches and the arch will be in the same line.

c—Public Highway Grade Crossing, Clinton Township.

Where the said main line of the Pittsburgh, Bessemer and Lake Erie Railroad in Clinton Township crosses the public highway extending from Butler to Culmerville (via Saxonburg) there is at present an oblique crossing at grade of the said public highway of the existing railroad tracks. It happens that near this crossing the proposed straightening of the railroad will begin, which makes necessary the moving over of the railroad tracks at the highway of 25 feet or more to the west, and the Railroad Company also proposes to lay two tracks across the highway, where one is now laid. The change in the location of the public road does not involve an alteration of the grades of the highway. It consists simply in shifting the position of the highway at that place so that the crossing will be more perpendicular than it is at the present time. The township supervisors have agreed to this plan.

d—Summit Road Crossing, West Deer Township.

The said Railroad Company is extending a branch line westward for about three miles to Mine No. 3 of the Ford Collieries Company. This line crosses Summit Road. The township supervisors have agreed that the Railroad Company may construct the railroad at Summit Road below grade, the plan providing for a girder bridge to sustain highway traffic of 100 pounds per square foot, equivalent to a load produced by a 15 ton roller. Twenty-two feet beneath the under part of the girder will be placed the top of the rails of the proposed track. The railroad is to be constructed in excavation here. Thirty feet on either side of the track centre is to be built concrete piers that will be carried up a sufficient width to support the main girder in position. This part of the highway bridge will be a through girder construction. On either side beyond these piers a 25 foot girder will be provided, one end resting on the pier and the other end on the timber abutment. The roadway of the bridge will be 24 feet wide. The 25 foot spans will be deck girder construction. The roadway surface on the bridge will have a grade of 2.4 per cent.

e—Church Road Crossing, West Deer Township.

Along the line of said branch railroad, and about one-third of a mile distant from Mine No. 3 of the Ford Collieries Company there is a public highway known as Church Road. The proposed railroad will pass under this highway in a cut. The railroad company and the supervisors of the township have agreed upon the plan. This plan provides for a through girder bridge 60 foot span, twenty-four foot roadway, the girders to be supported by concrete piers. On either side of the piers the bridge is to consist of a deck girder construction 30 foot span, making the total length of the bridge 120 feet. The outer end of the 30 foot girders are to rest on the timber abutments, this construction being adopted to permit of adjustment as the fill on the embankments settled. The final abutments will be of concrete construction. The north approach to the bridge for 230 feet in length is to be on an 8 per cent. grade, terminating in an existing 8 per cent. descending grade. The southerly approach is to be level instead of the existing 8 per cent. descending grade. The top of the rails of the tracks will be 22 feet below the lowest part of the highway bridge.

The Railroad Company will provide a temporary crossing while the highway construction is being carried on. The railroad company will keep the bridge in repair, and in the event of the abandonment of the crossing, it will restore the crossing to the township.

f—Batz Road Crossing, West Deer Township.

At Mine No. 3 of the Ford Collieries Company there is a highway known as Batz Road. This highway will have to be crossed by the branch line of the railroad, but it is proposed to make this crossing a temporary one. The railroad tracks are to be supported on the temporary trestle on either side of the highway, and by a deck girder bridge of 25 foot span over the highway, giving a vertical clearance of 15 feet or more for highway traffic beneath.

The railroad company and the supervisors of the township have agreed upon the plan, which provides for the laying out of the new Batz Road south of and parallel to and on the land of the Ford Collieries Company to connect with the Church Road, which is completed, it is proposed to abandon the old Batz Road (all on the Ford Collieries land) the portion to be closed amounting to about 3000 feet in length. The railroad company will then fill in underneath its tracks, and the crossing will be abandoned.

The grades on the new Batz Road will be no steeper than on the old Batz Road, but the new road will add materially to the vertical height to which all loads must be raised on the highway, but this is agreed to by the township supervisors.

g—County Road Crossing, West Deer Township.

The Bessemer and Lake Erie Railroad Company proposes to connect its branch line, operating over the grade of the Dorserville and Culmersville Road, and the plan has been agreed to by the county and railroad authorities. It provides for a widening trestle about 500 feet long for temporary construction. The alignment of the trestle is upon a 3° curve. The railroad will be carried over the county highway about midway of this trestle by a steel bridge. The abutments are to be of concrete masonry and the bridge of the steel girder type with at least 26 foot horizontal clearance between the abutments, and a vertical clearance of 16 feet

between the surface of the improved highway and the bottom of the steel girders. The highway between the abutments is to be improved for the full width of 26 feet. To protect the traveling public the railroad agreed to construct a suitable floor to the said overhead bridge, this floor to extend for a distance of 7 feet on either side of the centre line of the proposed track.

These several plans for crossings were approved by the Public Service Commission subject to certain conditions which appear elsewhere in the annual report of the Commission.

A-4. MISCELLANEOUS.

Certain crossings may be classed as miscellaneous including 10 crossings at grade of public ways and a street railway. They are described under this heading.

a—Hanover Township Grade Crossing.

The Delaware, Lackawanna and Western Railroad operate extensively in Luzerne County. The main tracks of this company are opposite Hanover Township, in Plymouth Borough and Plymouth Township. The company has a bridge over the Susquehanna River from these two places, and across this bridge there is a branch line extending southerly in Hanover Township with a switch to the Bliss mine of the Truesdale Colliery; also another branch to the Auchincloss mine. These two branches now cross at grade a township highway known as the Dundee Crossway. Owing to certain developments in the vicinity, it has become desirable and necessary to cross in two other places the said public road. Instead of attempting to establish these two additional grade crossings the company proposes to bring about an abandonment of a portion of the said public road and the substitution therefor of a new highway which shall pass under the two branches hereinbefore named. The plans for this change have been approved by the Hanover Township Commissioners, and an agreement has been entered into between the said township commissioners and the railroad company providing for the construction and maintenance of the new highway and two under passes. The railroad company will make all the changes at its own cost. Thereafter, the township will maintain the highway and the company will maintain the bridge.

One of the proposed under passes is now in existence. It comprises a stone arch culvert carrying the Auchincloss branch over Black Creek, sometimes called Nanticoke or Sugar Creek. The culvert has a radius of 16 feet and a vertical height at the crown above the bed of the stream of approximately 23 feet. It is proposed to build a concrete culvert in the bed of this stream. It will be a box shaped culvert with two compartments each 11 feet wide by 5 feet $7\frac{1}{2}$ inches high. The top of this culvert will be reinforced concrete, and it will afford the roadway surface with a new highway, which is to occupy the space above under the arch. There will be a vertical clearance of 14 feet for a height of 20 feet from the middle of the arch.

Adjacent to the culvert there is a concrete arch constructed to carry the proposed branch from the Auchincross breaker to the Dundee Shaft in the vicinity over the creek and the new highway. The construction for the water way will be the same as described in the preceeding paragraph, and above this water way at the crown there will be 19 feet head room. The radius of the arch is to be 12 feet. The box culvert will be constructed under stream for a distance of about 100 feet and a new channel will be constructed for the creek several hundred feet in length to assure drainage of the culvert. The only thing that could happen in the event of some extraordinary rainfall, overtaking the capacity of the culvert, would be an overflow temporarily, and the passage of the water over the box culvert and down the roadway through the arches to the street below.

On the Bliss Branch a new under pass is to be constructed. The railroad is to be carried over the highway on a plate girder construction, resting on concrete abutments, and providing for vertical clearance of 14 feet, and a horizontal clearance of 24 feet. There will be no pocket at this under pass, the grade of the highway affording sufficient grade for surface drainage.

The plans were approved by the Public Service Commission subject to certain conditions appearing elsewhere in the annual report of the Commission.

b—Grade Crossing, Hatfield Borough.

The Philadelphia and Reading Railway Company's petition states that the proposed crossing is in Hatfield Township. It has later developed that the public road to be crossed, known as Union Avenue, is in the Borough of Hatfield rather than in the Township of Hatfield.

Union Avenue is a public highway in the northern part of said borough having a width of about 2.5 rods, a nearly level grade and being quite well built up in this vicinity of the double tracks of the P. & R. Railway which the highway crosses at grade. Union Avenue crosses said tracks nearly perpendicularly and at a point 150 feet, or thereabouts, distant from the railroad it turns and extends southerly through the borough paralleling the railroad tracks. West of the railroad there is a road running northerly out into the country and between this road and the angle in Union Avenue to the west there are three dwellings with a brick and stone sidewalk in front. The highway has a macadam surface. Along that portion of the avenue paralleling the railroad a dwelling occupies every lot.

East of the railroad and 150 feet therefrom in Maple Avenue beginning at Union Avenue and extending southerly—it is on the lot between Maple Avenue and the railroad that the North Penn Washer Company has erected a brick building and arranged for a siding to the plant. Along the south side of Union Avenue, beyond Maple Avenue, there are several dwellings.

The crossing at grade of the highway and the railroad is now protected by a sign, an electric light and a track circuit bell, which announces the approach of every train.

One-quarter of a mile south is the Hatfield passenger station and a highway grade crossing of the railroad tracks. Hatfield Borough is a community of about 700 inhabitants. The grade of the railroad would have to be changed for long distances north and south to obviate the existing grade crossings mentioned. The one at the station is not protected by gates. It is reported that the citizens have requested the railroad company to provide and operate a gate at this crossing and that the borough council will withhold any approval of the proposed siding across Union Avenue at grade until gates are provided at the station highway. However, this is considered an immaterial point.

The North Penn Washer Company is ready for the siding. The switch and material is on the ground ready for the work. There is no way to avoid this grade crossing without abolishing the existing grade crossing of the main tracks.

The Commission approved the grade crossing.

c—Manatawny Railroad Bridge Over Pennsylvania and Reading Railroads near Stowe, Montgomery County.

The said Manatawny Railroad has a connection with and begins at the Pennsylvania Railroad near Stowe in Montgomery County, and thence extends northerly along and parallel to the said single track of the Pennsylvania Railroad, crossing the State highway at Stowe station at grade and also crossing a public highway known as Grosstown Road at grade. Thence on an embankment newly built and

at an ascending grade and over Dasher Run on a wooden trestle to a point about 2,000 feet distant from the beginning where the line of the railroad crosses obliquely, and on a curve, the existing three tracks of the Philadelphia and Reading Railroad. The single track of the Manatawney Railroad is to be carried over the said tracks by a steel truss bridge having a vertical clearance above the top of the rails beneath of 22 feet and a span of 120 feet between the abutments. This span provides for three additional tracks in the future in the location of the Philadelphia and Reading Railroad.

This bridge was approved by The Public Service Commission.

d—Deodate and Hershey Railway Crossing.

The Hershey Transit Company now operates an electric street railway in and out of Hershey Village, Derry Township, Dauphin County. One of the lines of this company extends southerly out of the village to the Campbelltown Turnpike and thence easterly in said turnpike. It is proposed to construct a new line to be known as the Elizabethtown Line of the Hershey Transit Company, from the said Campbelltown Turnpike southerly through Dauphin County and Lancaster County to the Borough of Elizabethtown.

The street railway herein described is to be constructed by the Deodate and Hershey Street Railway Company. It is to begin at a point in Conewago Township in the public road from Elizabethtown to Hockersville, where the public road from Campbelltown meets said road, north to the village of Deodate, at or near Shanks Church, at which point ends the proposed Elizabethtown and Deodate Street Railway, from whence the said Deodate and Hershey Street Railway is to be built northerly in Conewago and Derry townships, Dauphin County, to a point in Derry Township on a public road formerly known as the Downingtown, Ephrata and Harrisburg Turnpike, or Campbellstown Turnpike, where the old Hummels-town and Campbelltown Street Railway tracks are now laid and operated by the Hershey Transit Company.

In this distance of about 3.5 miles, 2 public highways are crossed at grade in Conewago Township, Dauphin County, and 3 public highways are crossed at grade in Derry Township, Dauphin County.

The petitioner holds to the view that no safety devices, safeguards, or other protective means are required to be installed for the safety of the public at the proposed grade crossings.

It is true that the country through which the proposed railroad is to pass is a sparsely settled and entirely rural district. There is little use made of the highway except as the resident farmers pass to and fro thereon. The method of operation over the said crossings at grade will be the usual and ordinary operation of street railways in suburban communities, stopping at road crossings and other convenient stations to receive and discharge passengers, to receive and deliver packages, milk shipments, farm products and supplies, merchandise and other light freight and property. But since the tracks will not extend along a highway where they may be seen and avoided but will cross the highways perpendicularly and thus the pedestrian or driver of a vehicle may be taken unawares at the highway crossings, it seems reasonable and in the interest of public safety that the railroad company be required to put up signs indicating the location of the crossings, and that the crossings should be constructed and maintained with respect to the grades of the highway, surface drainage, etc., in an entirely safe and satisfactory manner.

They were all approved, subject to certain conditions relating to the manner of construction of crossings and the maintenance of warning signs.

e—Elizabethtown and Deodate Railway Crossings.

Mr. M. S. Hershey, the noted chocolate manufacturer, whose plant is located at the Village of Hershey, in Derry Township, Dauphin County, has built and is operating more than one electric street railway line out of said village into the surrounding country. The Hershey Transit Company now operates a line southerly out of the village to the Campbelltown Turnpike and thence easterly in said turnpike. It is proposed to construct a new line from this turnpike southerly through Dauphin County and in Lancaster County to the borough of Elizabethtown.

The street railway herein described is to be constructed by the Elizabethtown and Deodate Street Railway Company. It is to begin at the public square in the Borough of Elizabethtown, Lancaster County and at or near the Elizabethtown station on the Pennsylvania Railroad and thence from this point and the present terminus of the Elizabethtown and Florin Street Railway, northerly along High Street in said borough and out into and through Mt. Joy Township, Lancaster County, and in Conewago Township, Dauphin County, to the public road from Elizabethtown to Hockersville north of the village of Deodate at or near Shanks Church.

In this distance of about 6 miles 2 public highways are crossed at grade in Mt. Joy Township, Lancaster County, and 3 public highways in Conewago Township, Dauphin County.

The Public Service Commission approved these crossings subject to conditions relative to the manner of construction and maintenance.

A-5. VIADUCTS.

The plans for several viaducts received the attention of the Bureau and the Commission. They are described in this section.

a—Butler Viaduct, Butler Borough.

Involving the consideration of the elimination of crossings at grade of highways and railroad tracks throughout Butler Borough, Butler County, Penna.

General Conditions.

Briefly, the Borough of Butler is a thriving, industrial community of over 20,000 population. Surrounding it is the township of Butler, which has a population of 6,000, most of which clusters about and composes the environs of Butler Borough. In 1900, the population of said Borough and Township was less than one-half of what it is to-day. This boom is attributable to the new industries which have located in the town. The Standard Steel Car Company has an extensive plant in the southeastern corner of the Borough extending out into the township along the creek into the village known as Lyndora.

Besides being the county seat, Butler Borough is also in the centre of a farming region and also in the natural gas and oil fields.

The entire settlement stretches along the Connoquenessing Creek. The section on the south side is the newer part. Connoquenessing Creek rises a few miles to the north in Butler County, and follows a general southwesterly course, entering the Beaver River near Ellwood City, 32 miles distant. The valley of this creek in places is quite narrow and deep. Throughout Butler Borough it broadens out a little but the slopes are quite precipitous.

The Borough is a hilly town. Down this valley and through the Borough are the tracks of the Pittsburgh, Bessemer and Lake Erie Railroad and the tracks of the Baltimore and Ohio Railroad. The West Penn Division of the Pennsylvania Railroad has a terminal station in Butler, and the Buffalo, Rochester and Pittsburgh Railroad runs its trains over the tracks used by the Baltimore and Ohio.

Street and Railroad Crossings.

Following the course of the Connoquenessing Creek down through Butler Borough, the crossing of streets and railroads are as follows:

Millerstown Road,
Kittanning Street,
Lookout Avenue,
Centre Avenue,
South Main Street,
Road to Lyndora.

Millerstown Road, or East Jefferson Street Extension, sometimes known as Kearns Road, leads into Butler from the northeast. The crossing is at grade (in Butler Township) with the road bed of the Bessemer and Lake Erie.

Five thousand four hundred feet distant from the Kearns Road Crossing, in the Borough of Butler is the crossing at grade of Kittanning Road on the Bessemer and Lake Erie tracks and the tracks of the Baltimore and Ohio Railroad. Thus far the said road beds lie to the west and north of the Connoquenessing Creek.

One thousand feet distant in the Borough Lookout Avenue crosses at grade the tracks of the West Penn Division of the Pennsylvania Railroad, the station being located on this street, at the corner of East Jefferson Street. Thence passing southerly Lookout Avenue bridges the creek and near the south bank passes under the Bessemer and Lake Erie tracks and over the tracks of the Baltimore and Ohio Railroad, both of these railroads lying south of the creek, the bridges over the stream being located between the Kittanning Road and Lookout Avenue crossings. The B. & O. roadbed is in a cut here and the P. B. & L. road a high embankment.

One thousand five hundred feet farther southwesterly, Centre Avenue, the main thoroughfare of Butler Borough, crosses at grade the tracks of both said railroads, but the valley being narrow here has required the construction of the tracks of P. B. & L. E. along the north bank of the creek at this crossing and the construction of the B. & O. tracks along the south bank, the passenger stations of these two companies being located on Centre Avenue. Both the highway bridge and the railroad bridge spanning the creek are sufficiently high to be above floods, but it would not do to lower this head room very much.

One thousand feet down stream South Main Street crosses at grade the tracks of said railroads and necessarily spans the creek, the railroads being located on either bank of the stream. The valley is narrow at this point also and the street grades are precipitous here as at Centre Avenue. Main Street, however, is not built up as thoroughly as is Centre Avenue, the road surface is unpaved and the highway bridge at the creek is a wooden structure condemned as unsafe.

One mile westerly at the extreme end of the Borough where the Standard Steel Car plant is located, partly in and partly outside of Butler, and the Village of Lyndora is located there is a crossing at grade of Pierce Avenue and the tracks of said railroads.

Between the South Main Street Crossing and Pierce Avenue crossing, the **tracks** of the Pittsburgh and Butler Street Railway are carried over the tracks of the said railroads at a private right-of-way belonging to the said Street Railway Company.

At Pierce Avenue, the P. B. & L. E. tracks and a number of parallel switches are located along the north bank of the creek. The extensive plant of the Standard Steel Car Company and Lyndora Village are also on this side of the stream. The south bank of the Connoquenessing Creek here is precipitous. The B. & O. tracks are located on this slope and parallel to and adjoining the railroad location is the main public highway, known as the Three Degree Road. Back of this road there is a real estate development, which bids fair to become quite extensive.

Discussion of a Plan for Eliminating the Grade Crossings.

It is roughly estimated that to elevate the railroads, thus permitting the grades of the streets to remain unaltered, would cost approximately \$1,550,000, divided as follows:

B. & O. R. R.,	\$650,000
B. & L. E. R. R.,	800,000
P. & B. St. Ry.,	50,000
Lookout Avenue,	50,000
	<hr/>
	\$1,550,000
	<hr/>

To this estimate should be added the cost of adjusting the industrial tracks and Standard Steel Car Company's yards to the new grade, which has been estimated at a half a million dollars and also declared by said industrial company to be undesirable and impracticable.

This plan would disturb sidings and the existing railroad facilities to abutting properties. Furthermore, the project would have to be executed all at one time and the total cost would have to be imposed and laid upon the various interests concerned all at once. Lookout Avenue would have to be changed in grade at the B. & O. crossing; there would be attendant property damages there and the grade of the street would be permanently steeper.

By elevating the grade of the streets, permitting the existing grades of the railroad sidings, freight yards and industrial plants, and the passenger stations to remain unaltered, would cost approximately \$520,000, divided as follows:

Kearns Road,	\$80,000
Kittanning Road,	80,000
Centre Avenue, .....1050 feet long,	180,000
Main Street, 800 feet long,	100,000
Pierce Avenue, 700 feet long,	80,000
	<hr/>
	\$520,000
	<hr/>

By this plan there would still be a crossing at grade on Centre Avenue in order to maintain highway traffic to the passenger stations and freight yards and abutting properties along Centre Avenue.

To eliminate this crossing would impose an additional expense for damages and new construction work of approximately \$100,000.

The advantages of this plan are, first, that the changes need not be undertaken all at one time. Centre Avenue viaduct as proposed can be constructed now, the money having been provided by vote of the electors of the Borough. The Main Street crossing can be abolished at some later period when the citizens of the Borough demand it, and so on. By this plan the present grades of Lookout Avenue need not be disturbed, neither the existing viaduct of the street Railway Company.

Furthermore, the travel from south into the heart of the Borough will be facilitated because the new grades of the highways will be substantially level where they cross the deep valley of the stream. Now the travel is compelled to pass down into the valley and thence up steep grades to the principal portion of the Borough.

The disadvantages relate principally to the injury to property along Centre Avenue and to the re-arrangement in the matter of getting to and from the Baltimore and Ohio freight and passenger stations. However, these disadvantages would not seem to warrant the expenditure of over a million dollars additional to secure the elevation of the railroad, and besides, the protest against this railroad elevation by the Standard Steel Car Company must necessarily be taken into account.

The elevation of the highways, viewed as a comprehensive plan, is a reasonable project, will confer the benefits desired at the least expense and permit the cost to be assumed and assessed gradually upon those interests that must contribute the funds.

The Commission has under consideration the plans and specifications of the viaduct, which have been approved with slight modifications by the Engineering Bureau.

b—Wilkes-Barre, Butler Street Viaduct.

Extension of Butler Street over the Tracks of the Lehigh Valley Railroad, Central Railroad of New Jersey, Delaware and Hudson Railroad and Pennsylvania Railroad in the City of Wilkes-Barre.

The proposed viaduct will be 1,350 feet long. The city had laid out a new highway across the said territory and railroad tracks. Therefore, the viaduct will not abolish a lawfully existing grade crossing. However, it happens that many citizens do cross the tracks at the point in question, although they trespass in doing so. Not a few of these trespassers are men employed by the said interested railroads or by corporations subsidiary to the railroads, and it has been agreed by the city and the railroad companies that common interests dictate that a public overhead crossing shall be provided here.

Pennsylvania Avenue is a thoroughfare. It is paved with brick, has flagged sidewalks and is lined with dwellings in the vicinity of Butler Street. This avenue parallels the railroad and is distant therefrom about 400 feet. At Butler Street, Pennsylvania Avenue has a lower elevation than the said railroad tracks. West of Pennsylvania Avenue there is a thickly built-up section of the city known as North Wilkes-Barre. East of the railroad tracks is the section known as East Wilkes-Barre. It contains a population of about 4,000. This territory will never in all probability be extensively developed as a residential district because the lands are principally owned by coal companies and are occupied by collieries and breakers, or held for mine operation purposes. However, there is a large amount of through travel as well as local travel between the said north and east sections of Wilkes-Barre and at present this travel has to cross the railroads either at Conyngham Avenue which is 2,000 feet to the north where the crossing is at grade, or at Scott Street which is about the same distance to the south, where the highway passes under the Lehigh Valley tracks and at grade across the Delaware and Hudson tracks and the Central Railroad tracks.

From an examination of the ground it will appear that when the grade crossings at Conyngham Avenue and Scott Street and at other streets in Wilkes-Barre along the lines of the said railroad are abolished, it will not involve a change in the elevation of the railroads at Scott Street and Conyngham Avenue and hence not at the site of the proposed viaduct at Butler Street.

The plans for the Butler Street viaduct call for a vertical clearance above the tracks of the railroads of at least 22 feet. In order to obtain this height without disturbing the existing grade of Pennsylvania Avenue, it is necessary to have the approach on the Pennsylvania Avenue end at a grade of 7.38 per cent. This is in excess of good practice. Eastwardly from the railroads the roadway of the viaduct will have a descending slope of 3.62 per cent.

As previously stated, Pennsylvania Avenue is paved and lined with residences. To raise the elevation of the avenue sufficiently to reduce the said grade of 7.38 per cent. to 5 per cent. would affect the present sidewalk and street grades in front of 70 dwellings located along Pennsylvania Avenue and on Butler, Thompson, John and Chester streets, which extend laterally from the Avenue.

It is estimated that the viaduct as now planned, including damages, will cost \$110,000. The City does not wish to expend over \$50,000 on the project. When the proposition to abolish all the grade crossings in the city was submitted to the voters, there was an item of \$35,000 as the City's share for the Butler Street over crossing. If we assume that the damages to the said 70 above properties would be at least \$40,000 the entire improvement would cost \$150,000 of which the City would have to pay, let us say, between \$75,000 and \$100,000. Probably \$100,000 is nearer what the City would finally pay as its share of such cost.

There is a trolley track in Pennsylvania Avenue. The proposed viaduct is to be 50 feet wide and is designed to sustain heavy street car traffic, should this ever be required. For the present, however, the Wilkes-Barre Railway Company will not lay tracks on the viaduct and will not assume any share of the expense of the bridge. Automobiles and heavy trucks and fire apparatus, however, will use the viaduct.

Some cities will not accept plans that call for a street grade in excess of 5 per cent. and strive to obtain grades of less slope. Here the City of Wilkes-Barre proposes, of its own accord, to establish a steep slope down on to a main thoroughfare where there is a trolley track running at right angles to the line of said steep declivity. The City Planning Commission has required the modification of the plans, namely the widening out of the approach at the foot of the slope in either direction at Pennsylvania Avenue so that vehicles may pass off the steep grade on to the Avenue in line with the traffic on said Avenue. This is as far as the City of Wilkes-Barre chooses to go at the present time. If the traffic becomes very considerable on the viaduct and public necessity then demands a lesser grade than 7.38 per cent., the City then at its own cost and expense, will take up the matter of reducing the grade and assume the cost at that time.

It is planned to pave the surface of the roadway on the steep slope with some one of the approved modern and so-called non-skidding surface materials. Some further minor changes in the design of the structure will be made before the plans and specifications are finally submitted for the approval of The Public Service Commission. Special traffic regulation relating to the traffic on the viaduct should be ordained by the City and enforced.

c—Homewood Hollow Viaduct.

The Pittsburgh, Harmony, Butler and New Castle Railway Company is extending its lines through the Borough of Homewood, Beaver County, and also across the highway leading eastward from Homewood Station to the river. The plans call for the erection of a viaduct known as the Homewood Hollow Viaduct, a steel structure 340 feet long comprising five spans, the shortest one being 30 feet, and

the longest being 80 feet. Near the top of the slope into Homewood Hollow on one side of the viaduct there is an old public road, little used, over which the said viaduct is to be carried with a span of 40 feet. The vertical clearance between the bridge and the surface of the road beneath is to be 15 feet. The girder will rest on a concrete pier at one end upon a steel tower at the other end, the road being about midway of the 40 foot span.

The plans were approved by the Public Service Commission.

d—Kohinoor Viaduct.

The Schuylkill Railway Company was notified by the State Railroad Commission of the unsafe condition of a trestle carrying the said electric railway over the tracks of the Philadelphia and Reading Railway in West Mahanoy Township, Schuylkill County. This was sometime during the year 1913. Changes were ordered but were not carried out, and finally in the spring of 1914, the State Railroad Commission having been superseded by the Public Service Commission, the latter notified the said electric railway company substantially to the effect, that if progress had not been made towards putting the structure in safe condition on or before April 1st, an order would be issued suspending traffic over the bridge. In pursuance of this last notification, the two railway companies interested drew up an agreement whereby the said Schuylkill Railway Company in the reconstruction of its railway ordered by the Public Service Commission, was to cross the tracks, right of way and property of the Shenandoah Branch of the Philadelphia and Reading Railway at two points, with a single track by overhead bridges, to be constructed approximately in the manner shown by a plan, said points of crossing being approximately 6,573 feet south of Shenandoah Station.

The plans provided that the electric railway shall cross over the steam railroad tracks upon a metal viaduct supported by metal columns on concrete abutments, with a head room of not less than 23 feet in the clear at one point and not less than 25 feet at the other point of crossing, and that there shall be a clear span of not less than 46 feet at the first point of crossing and not less than 42 feet at the other point of crossing.

Temporary repairs were made to the existing wooden structure. Single truck cars only were then run over the bridge and frequent inspections were made by agents of the Company as a necessary part of the safe operation of public traffic at this point. The foundations of the structure rested upon insecure ground, made so by reason of coal mining operations. Frequent settlements of ground occurred not only at the bridge but at other points along the route of this company's line in the Shenandoah Valley. A cave-in may occur at any moment.

This line extends down the valley to Girardville and it is the main means of transportation to the citizens of the numerous mining settlements in the district. To suspend traffic altogether over the old bridge would have required the patrons to descend a flight of steps to be built on the steep hillside from the trolley tracks to the highway below in the valley where they would have been obliged to cross at grade the tracks of the Philadelphia and Reading Railway Company; or a temporary bridge for foot passengers would have to be erected over the said steam railroad tracks; thence the patrons would have had to walk along the highway in the valley for several hundred feet and then climb a flight of steps to the roadbed of the trolley line at the other end of the viaduct. By the placing of bracing iron girders, additional trusses and replacement of unsound timber, the bridge was considered temporarily safe enough for the continued operation of single truck

cars over it. The proposed relocation of the viaduct is substantially along the property line between the Girard Estate and the Gilbert Estate. Here is maintained what is known as a barrier pillar not less than 50, or more than 200 feet wide. In this stretch of ground the removal of coal is not permitted and hence the foundation for the new structure, if resting on this barrier pillar, will be more secure than if it were placed in the location of the existing bridge. However, the approaches to the proposed viaduct will not be more secure than the approaches and the bridge have been.

Subject to a few modifications, the plans for the viaduct were approved.

e—Mahoning Avenue Viaduct.

Proposed Abolition of Grade Crossings at and in the Vicinity of Gardner Avenue, City of New Castle, Lawrence Co., Pa.

About ten years ago a project to construct a viaduct for highway traffic across the valley of the Shenango River, through the lower part of the City of New Castle, was considered jointly by the authorities of the said City and the County Commissioners. At that time the City, in contemplation of this improvement laid out a new highway, which may be designated as the Mahoning Avenue Extension, and the County Commissioners took over this extension and legally occupied it, so I am informed. However, the estimated cost of the viaduct having been found to be in the neighborhood of \$600,000.00, the project of building the structure was abandoned. It was revived by the County Commissioners during the year 1911, and plans and specifications were well along, so it is reported, for a shorter and much less expensive viaduct—substantially the project that is now under consideration by the County—when the flood of March, 1913, occurred, destroying the highway bridge at Gardner Avenue, which highway bridge was to be abandoned and substituted by the proposed viaduct. This destruction of the Gardner Avenue Bridge over which the traffic from Mahoning Avenue is carried, interjected a new element into the project—namely, that of the Commonwealth—since the Shenango River at this point is a navigable stream and the Commonwealth has obligated itself to reconstruct highway bridges that may be destroyed by flood on navigable streams in Pennsylvania.

In pursuance of law and the petition of the Commissioners of Lawrence County for a bridge across the Shenango River at Gardner Avenue, the Court of Common Pleas of Dauphin County appointed viewers to examine the location and report May 25th, 1913. At a meeting of said viewers on May 17th, Charles Adams, Esq., represented the Attorney General of Pennsylvania and Mr. J. V. McNary represented the State Highway Commission of Pennsylvania. The Commissioners of Lawrence County were present with their Attorney, William McElwee, Jr., and their Bridge Engineer, Thomas Gilkey.

It was ascertained that the Gardner Avenue Bridge, destroyed by flood and high water, March 27th, 1913, was a through 3-span Pratt Truss, with inclined end posts, steel highway bridge, with a roadway 20 feet in the clear and with sidewalks 6 feet wide on each side thereof; the floors of said roadway and sidewalk being of plank. The abutments and piers were of bridge masonry. The total length of the bridge was 380 feet, and its roadway floor elevated about 13 feet above the ordinary stage of water in the Shenango River.

This bridge connected the seventh and eighth wards of the said City. It supported the single track of the Mahoning and Shenango Street Railway Company.

The Viewers found that the accommodation of the travelling public in the said locality demands the rebuilding of the bridge which was a County bridge, having been erected by the County Commissioners in pursuance of an order of the Court at No. 3 March Sessions, 1890, 24 years ago, and was the first bridge built on said site. The Viewers reported that to rebuild a bridge on that site at the same elevation of the old structure to accommodate the traveling public, would cost \$60,000.00.

The Viewers further found and reported as follows:

That about 560 feet south of and practically parallel with said Gardner Avenue, by City Ordinance approved November 12, 1901, recorded Ordinance Book 5, page 245, the said City of New Castle ordained a 50 foot street calling the same Mahoning Extension. That at No. 7 December Sessions, 1901, Common Pleas of said Lawrence County, will be found the authority to said Lawrence County to build a 'bridge from Moravia Street over railroads and Shenango River,' with this final endorsement "April 7, 1902 above findings of Grand Jury and report of viewers approved By the Court.'

That said 50 foot ordained Mahoning Avenue Extension and said proposed bridge over railroads and Shenango River are not now actually built.

That from the point marked A to the point marked B on plan of Gardner Avenue herewith, are nine busy railroad tracks crossing said Gardner Avenue at grade.

That said Gardner Avenue is the main artery of travel from the Seventh Ward of the said City of New Castle to the rest of the City and that from five to ten thousand citizens of said City cross said Shenango River at the location of said destroyed bridge going to and from their daily work. That said Gardner Avenue is the route of the local double tracked street railway.

That by reason of said nine grade crossings, the public travel on said Gardner Avenue of the grade of the said destroyed bridge has become intolerably dangerous to said travelling public.

That in the opinion of your viewers it is imperatively necessary for the proper accommodation and safety of the travelling public that said destroyed bridge be rebuilt at an elevation sufficient to permit the building and construction of over-head crossings over said railroads, to-wit: the tracks of the Allegheny and Western Railroad, operated by the New York Central Lines, the tracks of the Erie Railroad, operated by the New York Central lines, and the tracks of the Pittsburgh and Western Railroad, operated by the Baltimore and Ohio Railroad. See plan herewith. That the old bridge was destroyed because of insufficient waterway under it.

That the elevation of the proposed new bridge as aforesaid, will in addition to above, greatly insure its safety against flood and high water.

That contracts can and should be made by the Commonwealth of Pennsylvania, through its Board of Public Grounds and Buildings, or otherwise, with the said City of New Castle, the said County of Lawrence, and the several railroad and street railroads interested, for the erection and construction of the approaches to said proposed bridge to be built at the elevation set out herein. All the findings under this Caption Nine we so report.

Accordingly the Viewers recommended the new location to be over the Shenango River on said Mahoning Avenue Extension, a fifty foot street, ordained as aforesaid, to be 560 feet south of and down said Shenango River from the site of the said destroyed Gardner Avenue Bridge; and the Viewers recommended that in lieu of the rebuilding by the Commonwealth of said destroyed Gardner Avenue Bridge, that a reinforced concrete arch bridge, having a clear waterway of 300 feet, a roadway of 30 feet, paved with brick, sidewalks on each side of ten feet, the clear waterway to consist of not more than three channel arches of 100 feet each, to be constructed, towards the expenses of which the Commonwealth should contribute \$60,000.00, the probable cost of replacing the old bridge.

This report was confirmed by the Court on July 9th, 1913, and the bridge was directed to be rebuilt by the Commonwealth of Pennsylvania, in accordance with the recommendations of the Viewers.

The City of New Castle, having a population of about 40,000 people is located in the Shenango and Mahoning River Valleys, just above the point where these streams combine to form the Beaver River. Entering the City from the extreme northwest corner is Neshannock River, which joins the Shenango River near the center of the City; and just above the confluence of these two streams and lying between them is a flat low area of land, covering about 650 acres, upon which is located a large portion of the business and manufacturing interests of the City. This area, as well as that lying on the southeast side of the creek, has been subject to inundations and damage by floods for many years, and the problem of protecting this area from further flood and damage has been the subject of special study by the City since the flood of March, 1913, and also by the State Water Supply Commission.

The Shenango River above New Castle has a drainage area of approximately 840 square miles. The topography of its watershed is generally hilly, but also contains some flat swampy areas. The river passes through the westerly and central portions of the City of New Castle and it is bordered on the east bank by the Erie Railroad, which to a large extent has formed an effective barrier against the direct flooding of the low portions of this City, although the back water from the Shenango River, passing up and overflowing the Neshannock Creek channel, has caused damage several times in the past.

The flood of March, 1913, raised the waters of the Shenango to a height never before equaled and caused them to break through the Erie Railroad embankment at a point over a half mile up stream above the Gardner Avenue bridge, near Grand Avenue, and flood the City.

The General Assembly of 1913, approved plans of the Pennsylvania Water Supply Commission for the construction of a large reservoir near the headwaters of the Shenango, above Greenville, and provided an appropriation for the beginning of this work, which, when completed, will reduce the danger of floods in the Shenango Valley, but not entirely eliminate them at New Castle.

The Gardner Avenue crossing of the Shenango River is located a short distance down stream from the confluence of the Shenango River and Neshannock Creek. It is the main highway across the valley in the lower portion of the City and it is a part of the comprehensive State Highway System of main routes in and out of New Castle.

The Board of Commissioners of Public Grounds and Buildings of the Commonwealth, proceeded according to law to appoint an engineer to draw up plans and specifications for the bridge, his compensation to be fixed by the County of Lawrence.

Mr. Emil Swensson, of Pittsburgh, was the engineer selected, and he prepared a general preliminary plan and an approximate estimated cost thereof. In the matter of building the new bridge and viaduct at the Mahoning Avenue Extension, in lieu of the site at the old Gardner Avenue Bridge, the County of Lawrence, the City of New Castle, the Youngstown Street Railway Company, the Buffalo, Rochester and Pittsburgh Railway Company, the Erie Railroad Company, the Pittsburgh and Lake Erie Railroad Company, the Baltimore and Ohio Railroad Company, and the State of Pennsylvania are proportionately interested and an effort has been made by Mr. Swensson to have said general plan approved by each and every one of the parties interested, before contract plans and specifications can be proceeded with.

This was substantially the situation at the close of the fiscal year.

A-6. GRADE CROSSINGS IN THE CITY OF READING.

In regard to the abolition of crossings at grade of the highways and tracks of the Philadelphia and Reading Railway in the City of Reading, conferences were had by the engineer of the Commission with his honor, Ira W. Stratton, the Mayor, and other city officials having such matter in charge. These officials have done nothing in the way towards the preparation of practicable plans for the abolition of the said grade crossings. It is true that much correspondence has ensued between the City and the railway company officials, but no encouragement has been received by the City from the said company in the matter of eliminating said grade crossings.

It was the hope of the Mayor and city councils that the Public Service Commission would initiate the surveys and make the plans for the said elimination. However, it was deemed impracticable by the Commission thus early in its history, and with the small force in its employ and at its command, owing to limited funds, to inaugurate the policy of initiative and preparation of detail plans for big projects of this kind. This determination by the Commission was a disappointment to the City of Reading. However, the Commission did inform the Mayor that it would act upon such plans as might be prepared either by one or both of the parties interested in Reading.

The result of the conference of the engineer of the Commission with the said city officials was to bring out the fact that the city would, if found absolutely necessary, employ a competent expert engineer, skilled in these matters, to study the problem and to prepare plans for the elimination of the grade crossings at Penn Street and at Franklin Street and at such other streets along the main line of the Reading Railway as would necessarily be involved in the project. However, it was the unanimous opinion of the city council that the engineering ought to be initiated by the Railway Company, more especially since the problem involves changes in the Franklin Street Passenger Station and probably at the Union Station and the Union Yards. It seemed to the City that no matter how competent an engineer it might employ, no plans could be evolved that would be as satisfactory to the Railway Company as those plans that might be prepared by the Railway Engineering Department. In consequence, the Mayor requested that the Public Service Commission endeavor to prevail upon the Railway Company to undertake the preparation of the plans either alone or in conjunction with the city, and that the work should be largely done by the railway engineers.

It appearing evident that much time and duplication of work could be saved in the preparation of the plans if the work be done by the Engineering Department of the Railway Company, a conference was had between the engineer of the Company and the engineer of the Commission. The outcome was exhibition of an evasive attitude on the part of the Company to take up the problem at the present time.

The Mayor is reported to have appointed the city engineer and the engineer of the water works to prepare plans and estimate of cost for the City, but at the expiration of the fiscal year no funds or adequate amounts of money had been provided for the prosecution of this work.

A-7. WILKES-BARRE CONNECTING RAILROAD.

Abolition of certain grade crossings in Wilkes-Barre and vicinity by the construction of a connecting railroad around the City.

General Conditions.

The City of Wilkes-Barre is located along the east bank of the Susquehanna River, partly on a level plateau a considerable portion of which, in the section known as South Wilkes-Barre, is subject to annual inundation,—a fact of relevance in this case,—and partly back on the hillsides which rise steadily to the summit

of the Wilkes-Barre Mountain. Opposite Wilkes-Barre are extensive flats about a mile and a half wide which are also largely subject to inundation during extraordinary floods. In spite of this the land has become extensively occupied by dwellings and here may be found the Boroughs of Edwardsville, Dorranceton and Forty-fort.

On the north, Wilkes-Barre is bounded by Mill Creek, the Township of Plains and the Borough of Parsons and Miners Mills.

In the City, back from the river where the flats end, may be found the tracks of the Pennsylvania Railroad, the Lehigh Valley Railroad, the Central Railroad of New Jersey and the Delaware and Hudson Railroad, all side by side. In the outskirts of the City, these railroads branch in various directions.

Excluding that section of South Wilkes-Barre where the connecting line is being built and the extreme eastern portion of Wilkes-Barre where there are two or three crossings which have no relevance to the matter in hand, there are in the City 27 streets which are crossed by steam railroads. Such crossings at grade number in all 44 and such crossings either over or under the railroad tracks number 7. In the following table the names of these streets and the number and class of crossing are given:

Crossings of Steam Railroads and Highways in the Central Part of Wilkes-Barre.

Highway.	At grade.	Street over or under railroad.	Total.
Division Street,	1	.....	1
Horton Street,	1	.....	1
Barney Street,	1	.....	1
Franklin Street,	2	.....	2
Main Street,	5	.....	5
Old River Road,	1	.....	1
Carey Avenue,	1	.....	1
Wood Street,	2	.....	2
Race Street,	1	.....	1
Hanover Street,	2	.....	2
Parrish Street,	3	.....	3
Blackman Street, .....	.....	2	2
Walnut Street,	1	.....	1
Dana Street,	3	.....	3
Hazle Avenue,	3	.....	3
South Street,	1	3	4
Northampton Street,	3	.....	3
Lehigh Street,	1	.....	1
Hill Street,	1	.....	1
Pennsylvania Avenue,	2	.....	2
River Street,	1	.....	1
North Street,	1	.....	1
Market Street,	1	.....	1
Conyngham Avenue,	3	.....	3
Johnson Street,	1	.....	1
Scott Street,	1	1	2
Washington Street,	1	1	2
	44	7	51

The streets in the table are named in order in passing through the City from the south to the north.

In addition there are four points in the city where a railroad crosses a railroad at grade. This makes a grand total of 55 railroad crossings.

Summary.

Grade crossings—		
Highways and steam railroads,	44	
Railroads and railroads,	4	
		48
Crossings over or under railroads—		
Highways over railroads,	6	
Highways under railroads,	1	
		7
Grand total,		55

In several of the highways there are street railway tracks which cross the railroad. There are also numerous switches into industrial plants. The Pennsylvania Railroad and the D. & H. Railroad have respectively 8 and 9 street grade crossings. The Central Railroad and the Lehigh Railroad have, respectively, 12 and 15 street grade crossings. Each of these railroads maintains a crossing at grade of another railroad. The number and kind of crossings of these four railroads in the section of the City under discussion are shown in the following tabular statement:

Classification of Railroad Crossings.

Railroad Company.	Street Crossings.				Across Railroad by R. R.	
	At grade.	Street over.	Street under.	Total street crossings.	At grade.	Total R. R. Across R. R.
Penna.,	8	1	0	9	1	1
D. & H.,	9	0	0	9	1	1
Central,	12	2	0	14	1	1
Lehigh,	15	3	1	19	1	1
Totals,	44	6	1	51	4	4

The City endeavored to bring about an abolition of these crossings. A comprehensive plan was agreed upon by the parties in interest. The project involved an estimated cost of \$3,000,000, of which the City was to pay \$900,000. This proposition was submitted to the voters of the City early in the year 1912 and was defeated.

The Pennsylvania Company and the D. & H. Company then entered into a working agreement which brought about the incorporation of the Wilkes-Barre Connecting Railroad Company under the laws of Pennsylvania. This was in November, 1912. The principal reasons for this action was to avoid the charges paid by these two railroad companies to the Lehigh Valley Company for transference of traffic between the two over the Lehigh's tracks.

The Pennsylvania Railroad enters Wilkes-Barre from the south and ends in the center of the City. The D. & H. Railroad tracks enter from the north and end in the center of the City. There is a space intervening between these two ends in the center of the City that is traversed by the Lehigh Valley tracks. The D. & H. has a branch line from Plymouth which enters South Wilkes-Barre, and terminates

in a connection with the Pennsylvania and the Lehigh tracks. The only way that the cars of the D. & H. and Pennsylvania Lines can pass northerly to the other tracks of the D. & H. in Wilkes-Barre, or vice versa, is by use of the tracks of the Lehigh Valley Railroad (or the Central) traversing the narrow zone in the centre of the City. It is stated that this transference amounts to many train movements each 24 hours and that the annual charges amount to a sum sufficient to warrant the cost of the building of the proposed connecting line around the city between the tracks of the Pennsylvania and the D. & H. on the south and the main line of the D. & H. to the north of the City in Plains Township. Furthermore, the avoidance of great delay in train movements through the City, due to switching and hold-ups at grade crossings has been an important consideration. By means of the new connecting line around the City instead of train movements comprising a few cars per movement, the traffic will be composed of heavy slow moving trains of many cars, thus shortening the time of transit and reducing the cost of operation.

It will be possible in the future to send through Lehigh freight trains around the city over the proposed connecting line if this were found to be desirable.

It is not contemplated by the railroads to give up any of their holdings in the city, or to abandon the use of their lines and track facilities to industrial plants; but the improvement will relieve the congestion of traffic due to the haulage of freight through the City, and to this extent, materially reduce the existing delay to the street traffic, at the highway crossings hereinbefore mentioned.

Proposed Wilkes-Barre Connecting Railroad.

This road is to be 7 miles long. It is to begin at a point of connection with the Northern Coal and Iron Company's railroad (understood to be a subsidiary of the D. & H.) at or near Hudson Station on the D. & H. Railroad in Plains Township, thence westerly through Plains Township, Miners Mills Borough, and in said township, passing by and near Parsons Borough and the City of Wilkes-Barre to the Susquehanna River, near the mouth of Mill Creek; thence across the said river and southerly along the flats through the Boroughs of Dorranceton and Edwardsville to the Susquehanna River; and thence across said river and through a new developed section of Wilkes-Barre, commonly termed South Wilkes-Barre, to Hanover Township; and thence continuing southerly in said township to a connection with the Sunbury Division of the Pennsylvania at Buttonwood in said township.

The said connecting railroad is planned to pass over 16 highways, over 4 steam railroads, over 1 express electric railway, over 2 farm lands. It is also planned to cross at grade 4 highways and 1 steam railroad, and by the plan, 1 street grade crossing will be abolished, making a total of 5 grade crossings proposed and 23 overhead crossings.

At Hudson the facilities of the Northern Coal and Iron Company yards will be utilized for storage purposes.

Over the Susquehanna River at the south of Mill Creek the existing bridge and tracks, for some distance on either side, of the Wilkes-Barre and Eastern Railroad Company will be utilized, enlarged and improved. The said Wilkes-Barre and Eastern Railroad was constructed many years ago. A passenger station was built on the flats at Market Street in Dorranceton, opposite the City and on the west bank of the river. From this point the road was built on an embankment northerly to the river and thence over the river and through Plains Township easterly for a number of miles. For a number of years past, that portion of the road from Plains village back of Miners Mills Borough easterly has been the only part of

the railroad that has been operated. The Wilkes-Barre Connecting Railroad Company has secured certain rights and will double track the bridge over the river for its own purposes and the use of the said Wilkes-Barre and Eastern Company; and will also provide an additional track for the Delaware, Leekawanna and Western Railroad Company that has a prior right and is constructing a narrow gauge mine track extending from the "Peach Orchard" Colliery near Parsons to the Pettibone Beraker in Dorranceton Borough to the north.

The Wilkes-Barre Connecting Railroad Company will also widen the existing bridge of the Wilkes-Barre and Eastern Railroad over the tracks of the Lackawanna and Wyoming Valley Railroad (Laurel Line) and the Harveys Lake Branch of the Lehigh Valley Railroad, and the existing bridge of the said Wilkes-Barre and Eastern Railroad over North River Street, and the existing bridge under said Wilkes-Barre and Eastern Railroad over the tracks of the Lehigh Valley Railroad and the Central Railroad of New Jersey so as to carry two standard gage tracks and one narrow gauge track, all as agreed upon by the parties mentioned. It is represented that the Wilkes-Barre Connecting Railroad Company will maintain the bridges and facilities provided by it and used by the said Wilkes-Barre and Eastern and the said D. L. & W. Railroad Companies.

In Hanover Township and South Wilkes-Barre, the existing track and bridges and facilities of the Northern Coal and Iron Company will be utilized. Said Northern Coal and Iron Company (hereinafter referred to as the Plymouth Branch of the D. & H.) operates a coal railroad from Plymouth Borough or Larksville Borough west of South Wilkes-Barre on the opposite bank of the Susquehanna River, southerly over the river and across certain highways in Wilkes-Barre to a connection with the Lehigh Valley Railroad. About 8 years ago, what is known as the Buttonwood Branch of the said Northern Coal and Iron Company (hereinafter referred to as the Buttonwood Branch of the Delaware and Hudson Railroad) was constructed from a point of connection with the Sunbury Division of the Pennsylvania Railroad at Buttonwood in Hanover Township, northerly for a distance of over a mile in said township, crossing at grade the Plymouth Ferry Road and being carried over Carey Avenue and also a farm lane in said township, to the City of Wilkes-Barre line; thence it continued northerly in said City a distance of three-fifths of a mile to and connected with the Plymouth Branch of the D. & H., being carried over the following streets by through plate girder bridges built for double track. The overhead bridge at Carey Avenue is also double tracked.

Tabular Statement as to Existing Street Crossings.

Street crossing.	Vert. clearance bet. St. surface & bottom of bridge above.	Street span.	Proposed Alterations.
Old Ferry Road,	At Grade	.....	None.
Carey Avenue,	14.5 ft.	Bridge column in street centre,	None.
Simpson St.,	12.0 ft.	Columns in street gutter,	None.
Willow St.,	12.0 ft.	Clear span,	None.
Oak Street,	12.0 ft.	Clear span,	None.
Lawrence St.,	13.0 ft.	Clear span,	None.
Horton St.,	16.0 ft.	Clear span,	Bridge to be raised 2.5 ft.
Dagabert St.,	16.0 ft.	Clear span,	Bridge to be raised 5 ft.

Between Dagahert Street and the said Plymouth Branch there now exists what is called an overflow bridge. It is a steel deck girder structure wide enough for two tracks and being supported on masonry piers, four in number, between the abutments. The land is low here and during flood times a very considerable body of water passes over the surface of the ground southwesterly towards the river from a point further up the valley. If the openings were not provided, the flood waters would pond up and do more damage than now. This structure is to be widened and raised from 5 to 10 feet in height and will be carried over the Catlin Farm lane, that is to say, the tracks extending beyond this overflow bridge will be carried over the lane and be connected to the proposed new construction to be built by the Wilkes-Barre Connecting Railroad.

These facilities of the Buttonwood Branch of the D. & H. Railroad have been acquired and will form a part of the Wilkes-Barre Connecting Railroad. This was done prior to the creation of the Public Service Commission, so it is represented.

The new construction work proposed by the Wilkes-Barre Connecting Railroad Company is to comprise the double tracking of the existing Buttonwood Branch and the elevation of the grades thereof approaching the tracks of the said Plymouth Branch in order that the said connecting railroad shall pass over the existing tracks of the said Plymouth Branch at the point where these two lines intersect at right angles. The clearance here is to be 18 feet only in height. The horizontal clearance between abutments is to be 57 feet, which provides for the three existing parallel tracks of the Plymouth Branch and one additional track. The plan filed by the petitioner shows the vertical distance between the top of the rail and the bottom of the main girder above of 17 feet 11 inches. The petitioner's written statement is as follows

"The said Northern Coal and Iron Company has consented that the crossing may be made as proposed and is satisfied with the plans as submitted."

It is good practice to have a vertical head room of 22 feet. There are quite a number of 18 foot clearances in existence. As the Plymouth Branch is not much more than a switch to the coal breakers across the river, and as the expense involved of increasing the proposed clearance would be very considerable, it is believed by both railroads concerned that the proposed plans are absolutely the most practicable, so it is presented by the petitioner. The railroad crossed has not objected but there is no copy of the agreement between the two companies on file in the Commission's office.

Bearing in mind that coal cars are not as high as box cars that are used on general traffic lines, it would appear that the contention of the petitioner relative to the head room at this particular crossing be reasonably sustained, and more especially since this point of crossing is the summit of the grades in either direction of the proposed connecting railroad.

The height of the proposed bridge over the Susquehanna River and its design has been determined by consideration of a waterway beneath and clearance over the highways on the flats in Dorranceton. This bridge is to be located where the main stream formerly consisted of two channels, separated by Fish Island. The North Channel is completely filled with culm and silt and at its upstream end was at one time blocked off with jetty, erected by the U. S. Government to maintain navigation. The bridge is to have 7 spans, the north abutment and 3 spans being over a portion of Fish Island, which is to be excavated. The channel north of the island will be crossed by fill. At present this channel only carries water at normal flood. There are to be 7 through truss spans, each 173 feet in length to support the tracks over the road along the bank of the river, which road is known as the Riverside Boulevard.

The tops of the piers are to be elevation 539 and the under clearance line of the steel work at elevation 542. The maximum flood elevation at this point is 538. The normal surface of the water is elevation 505 and the bed of the river at the deepest section is approximately 497. So it may be noted that the tops of the piers are located one foot above maximum flood height, and the under clearance of the bridge is four feet above this height and 37 feet above normal water elevation and 45 feet above the bed of the stream.

The normal width of the south channel of the river here is 750 feet and the entire length of the proposed grade from the north abutment to the south river bank is 1211 feet, so that approximately 460 feet of Fish Island are to be spanned by the bridge. As before stated, it is proposed to excavate the island from the river edge on the north bank to the north abutment, the material amounting to about one million cubic yards of culm, gravel, sand and clay to be used in making the embankment to support the railroad across the flats and north of the north abutment of the bridge. This excavating of the island will increase the width of the river at this point to an average of 1,200 feet.

The State Water Supply Commission has approved this structure with the stipulation:

1. That the material excavated from abutment and pier foundations be deposited at points to be approved by the Commission.
2. That in case navigation is improved on this river by State or Federal authorities, the applicants agree to install a draw span in this bridge at their own expense, if required.
3. That all false work piling, used in the construction of the superstructure or piers or abutments, be removed from the river when the work is completed.

In South Wilkes-Barre, between the railroad bridge and the crossing over the Plymouth Branch of the D. & H., the proposed connecting line will cross by overhead bridges the following streets. Marlborough, Amherst, Maffet and Miner. Also Riverside Boulevard, hereinbefore referred to. The crossing of Academy and Birch Streets will be avoided by extending Pickering Street parallel to the railroad to intersect the two.

With respect to the streets and matters of drainage flood protection, etc., the City of Wilkes-Barre, the land owners and the railroad company are now conferring, and it is probable that one or all of these 4 proposed crossings may be entirely abandoned by substituting a fill over them and the construction of a flood dyke along the south bank of the river. To this end an agreement in writing is now being considered and if signed, a copy will be presented to the Commission, and the petitioners will ask for a modification of the plan to conform to the provisions of the agreement.

The railroad embankment through the flats in Edwardsville and Dorranceton is being surface lined to above the flood level with concrete slabs. At Northampton and Pierce Streets clear span bridges are provided with head rooms of 17 and 20 feet respectively. At Market Street the vertical clearance is 14 feet 10 inches only, between the under side of the plate girder and the street car rails, all local parties in interest having agreed to this height.

Relative to the Wilkes-Barre and Eastern Railroad bridge over the river at the mouth of Mill Creek, which is to be improved and used as a part of the proposed connecting line, this bridge at present consists of six spans over the river proper and a crossing over the Lehigh Valley Branch Line standard gauge and a mine

track narrow gauge and over the two tracks of the Laurel Electric Railway. The latter are located on an embankment along the east bank of the river; vertical head room 16 feet plus. The said Lehigh tracks are parallel to the Laurel Line but located in a depression with a vertical clearance of 32 feet. The span across the Laurel Line is 35 feet and across the Lehigh tracks 65 feet with an intervening connecting span of 17.5 feet. The rails will be raised 1.31 feet above the present level and new plate girders will be placed on the existing piers and abutments, this being made necessary on account of the heavier trains and traffic proposed for the said connecting railroad.

The clearance line of the bridge over the river on the Wilkes-Barre side is elevation 352, or 11.2 feet above high watermark. The grade descends so that at the west abutment on the other side of the river the clearance elevation is 549 or 8.2 feet above maximum flood.

In utilizing this structure, the applicant proposed adding 5 short deck girded spans, 3 of which were to be 60 feet centre to centre of piers, and the other two 75 feet each; these additional spans to be on the Dorraneeton flats beyond the west end of the present bridge, they being provided to afford a passage way for flood waters. The plan provided that the approach to this bridge with the additional spans should be on fill 45 feet high with side slopes 1.5 to 1, the fill being on a 4° curve. The additional spans proposed would have afforded an increased waterway area of 2,210 square feet below the maximum flood line, making a total of 30,271 square feet under the bridge as proposed to be altered. The following information was furnished by the applicant:

Comparative Statement of Flood Areas of Susquehanna River
Bridges, Overflow Bridges, Etc., in the Vicinity of Wilkes-Barre,
Pa., Below High Water, 1902 Flood.

Going Down Stream in Regular Order.	Degree of skew.	River bridge.	Clear Opening.		Total.
			Overflow Br. No. 1.	Overflow Br. No. 2.	
L. V. R. R. bridge, Port Bowkley,	70	30,000	.....	.....	30,800
W. B. & E. R. R., bridge,	80	28,061	2,210	.....	30,271
Pierce Street,	75	24,206	4,023	3,182	31,411
Market Street,	Slight	22,520	1,200	400	24,120
W. B. C. R. R., bridge,	60	37,400	.....	960	38,360
D. & H. Co., Plymouth Branch,	Slight	23,135	5,255	2,360	30,750
D. L. & W. R. R., bridge,	65	28,057	.....	8,094	36,151

It will be seen that the smallest bridge opening is at Market Street and that the next smallest, after adding the five additional spans, is the said existing bridge over the river at the mouth of Mill Creek. Past floods have clearly demonstrated that the Market Street bridge is insufficient. There is a project on foot to elevate Market Street across the flats and to build a new structure over the river.

The State Water Supply Commission approved the plans for the proposed alterations but required 8 spans to be built in addition to the existing bridge. The stipulations were as follows:

1. The Wilkes-Barre and Eastern Railroad bridge to be extended westwardly 8 spans, consisting of three 60 foot and five 75 foot plate girder spans, with a clearance to correspond with the sub-grade shown.
2. The material excavated from the foundations for that abutments and piers to be used in constructing the proposed fill and all false-work and coffer dams to be removed, where they lie below the flood elevation.
3. In case of the improvement of navigation in this stream, by State or Federal government, the applicant agrees to install a draw span, or make any other required change in the structure to facilitate navigation.
4. The slopes of the proposed fill to be protected by rip rap up to maximum flood elevation.

A project is being taken under advisement by the State Water Supply Commission, the Federal Government and the municipalities interested for the construction of a dyke along the west side of the Susquehanna River through the Boroughs of Forty-fort, Dorranceton and Edwardsville, in order to prevent the direct overflow of the river, which now takes place over the flats, immediately below the west abutment of the Lehigh Valley Railroad, Port Bowkley bridge in Forty-fort. This dyke, if built, will pass southerly to the west abutment of the proposed new bridge of the connecting railroad and thence southerly along the river to the north abutment of the proposed connecting railroad bridge at Fish Island. Such a dyke will eliminate the velocity when the floods inundate the fields; so that their submergence thereafter will be by back water only coming up from Fish Island. The depth of the submergence at the upper end of the plant would then be four or five feet less than at present.

With respect to the proposed overhead crossings at H and I (reference to the paper book and accompanying plans), there is nothing to offer of special interest except that the head room over River Street will be increased 15.75 feet. Over the main line of the Lehigh Valley there will be approximately 30 feet clearance and over 25 foot head room above the main track of the Central Railroad of New Jersey. Above the three mine tracks of the Lehigh Valley there will be a clearance of approximately 20 feet.

Proposed Grade Crossing in Plains Township at Main Street Extension.

This is a country road little used at present. It is not a main thoroughfare as the name would indicate, and it is not likely to become a future thoroughfare. In North Wilkes-Barre where the road crosses Mill Creek, it is named Main Street. Crossings at grade exist of the Lehigh Railroad tracks in the City and of the Lehigh and the Central Railroad tracks in the township. In the bottom of the valley near the creek. Thence the road ascends up a steep hillside and crosses at grade about half way up the hill the present tracks of the Wilkes-Barre and Eastern Railroad.

To make the situation worse, the crossing is at a very oblique angle. Along the oblique line from the existing railroad tracks, distant 130 feet further down the hill, will be built the narrow gauge mine track of the D. L. & W., and paralleling it two additional standard gauge tracks of the Wilkes-Barre Connecting Railroad. These three tracks will be laid on a bench and are or will be 10 feet lower in elevation than the W. B. & E. tracks. The railroad grade cannot be altered at this point to any substantial amount, so that if the crossing at grade is to be

abolished, the highway only must be changed. It is not practicable to carry the highway over the said four tracks and to carry the highway under at this time would involve an outlay of at least \$100,000, estimated. The traffic on the public road does not warrant this expenditure. There is not a dwelling or building on the highway within half a mile. The travel is almost entirely in and out of North Wilkes-Barre via River Street. Probably, if the time ever comes, for the crossing to be abolished, another location will be chosen, both for economy sake and the convenience of the public.

The township authorities desire some minor things to be done at this crossing, such as retaining walls, gates, etc. If possible, these matters should be the subject of an agreement between the said township authorities and the railroad company, and the written agreement should be filed with the Commission.

Crossing at Grade of Steam Railroads in Plains Township.

The D. L. & W. narrow gauge tracks will cross the double tracks of the connecting railroad at a point 700 feet east of the Main Street highway grade crossing in Plains Township. The tracks of the W. B. & E. Railroad will cross the tracks of the connecting railroad and the narrow gauge railroad at a point several hundred feet west of the said highway grade crossing. This is made necessary for the reason that the W. B. & E. Railroad deflects to the north, in Plains Township and the narrow gauge railroad deflects to the south and crosses over Mill Creek via a steel viaduct on its way to "Peach Orchard." Where the three tracks are bridged over the river, the narrow gauge railroad is on the north side, the W. B. & E. Railroad on the south side and the connecting railroad is in the middle; hence, in deflecting to the north, the W. B. & E. tracks must cross the tracks of the other two railroads, and the narrow gauge road must cross the tracks of the other two railroads. The proposed grades of the connecting railroad, as previously stated, cannot be changed much, and it is not practicable to materially alter the grades of the other two railroads, more especially that of the W. B. & E. Railroad. The connecting railroad company proposes at its own cost to erect a signal tower and to operate the same in connection with interlocking signal protection for the several grade crossings hereinbefore mentioned and the company will file detail plans of the same with the Commission for its approval.

Agreement to avoid grade crossing of the tracks of the Central Railroad of New Jersey, Lehigh Valley Railroad and W. B. Connecting Railroad.

The Central Railroad Company of New Jersey leases and operates the Lehigh and Susquehanna Railroad including the so-called "Canal Branch." The Lehigh Coal and Navigation Company owns and has leased the said Lehigh and Susquehanna Railroad including said Canal Branch, to the said Central Company. The said Central and Lehigh Company have entered into an agreement with the Wilkes-Barre Connecting Railroad Company for the most advantageous construction of the latter railroad in Plains Township and Miners Mills. It is desirable to construct a portion of this new railroad on the lands and right of way of said Canal Branch now owned by the Lehigh Company and held, occupied and operated by the Central Company; namely, on that portion of said lands and right of way extending from Mill Street in Miners Mills Borough to a point in Hollenback Park in the Borough of Parsons and in the township of Plains. In order to so construct said line of railroad, it is necessary to re-locate the existing and operating tracks of said Canal Branch by removing the same from its present location to an alignment southerly

therefrom, and to provide therefor other lands and right of way. Such removal and relocation will improve the general conditions and facilities of said branch and avoid crossings thereof by the said proposed line of the connecting railroad. The agreement therefor provides for these things to be done. The Wilkes-Barre Company is to take up and remove from across the present existing track of the Canal Branch the grade crossing to N. J. Healey's Breaker, and to construct and maintain an undergrade crossing for a narrow gauge mine track under said relocated line at a point in the neighborhood of the existing grade crossing. The Wilkes-Barre Company has also agreed with the said Central Company and Lehigh Company to construct, maintain and operate crossing gates of approved pattern protecting the crossing of Mill Street in Miners Mills borough by the tracks of the Canal Branch and of said Wilkes-Barre Company, and to also protect the crossing of said tracks by the track or tracks of the Wilkes-Barre Railway (Traction) Company east of the said Mill Street.

The copy of the agreement of said companies has been filed in the office of the Public Service Commission.

Crossing at Grade of Mill Street and the Wilkes-Barre Street Railway in Miners Mills Borough.

The Central Railroad of New Jersey crosses said Mill Street in Miners Mills borough at grade and also at grade near Mill Street Railway. The Wilkes-Barre Connecting Railroad Company proposes to build double tracks across Mill Street at grade and across the said street railway at grade. The new tracks will be parallel to and not over one hundred feet distant from the said Central tracks. They will be 8 feet higher in elevation because Mill Street rises on a steep grade here. The situation is a dangerous one. Practically all the travel from Plains village to Miners Mills borough comes by this crossing. It is perfectly practicable to avoid this crossing at grade of the highway and the street railway by the construction of an overhead street viaduct that shall carry a trolley and street traffic. The cost of this project need not be prohibitive. It would mean the abolition of two existing grade crossings and the prevention of two additional grade crossings. The trolley company has agreed with the connecting railway company for the additional crossing, but the borough of Miners Mills will protest against the establishment of a grade crossing here. The grade of the connecting railroad cannot be altered. It is not practicable to carry the highway and trolley track under the railroad because Mill Creek is about 200 feet distant and but a few feet lower in elevation. Furthermore, the Central Road has a switch into the mills at this point and a connection to the Lehigh Valley tracks, so that but one thing can be done, namely, as hereinbefore stated, to elevate the highway and the trolley tracks. Mr. McMartin stated that his company would prepare the plans for this modification if ordered so to do by the Commission. However, said company does not wish to be delayed in the construction of other portions of the connecting line which may meet with the approval of the Commission by reason of alterations in the plans at Mill Street which the Public Service Commission might order.

Concerned in Mill Street and Vicinity are the following corporations:

Miners Mills Borough,
Central Railroad of New Jersey,
Lehigh Coal and Navigation Company,
The Wilkes-Barre Connecting Railroad Company,
The Wilkes-Barre Railway Company,
Township of Plains.

The Wilkes-Barre Connecting Railroad Company might prepare plans and estimates of cost for avoiding this grade crossing of the highway and street railway and endeavor to enter into an agreement with the parties in interest as to the proportion of the cost to be defrayed by each, and report to the Public Service Commission preliminary to a special hearing to be given in the case.

Oak Street Grade Crossing, Plains Township.

At Oak Street there are now 9 parallel tracks crossing Oak Street at grade. These tracks are used for storage and shipping purposes. The highway is a dirt road unimproved. It has the appearance of being little more than a lane, but the citizens of the township would remonstrate to the abandonment of this road. The grade of the tracks cannot be materially changed. The highway could be taken over by a bridge. The Wilkes-Barre Connecting Railroad will add two other tracks here and it is represented that there will be less obstruction to travel after the connecting railroad is built and operated at this point than now because there will be less switching back and forth over Oak Street. The township authorities do not ask for the abolition of the grade crossing, but they ask that it be properly protected by a light and by gates. The railroad company has expressed a willingness to do anything reasonable requested by the township authorities, and if possible an agreement in writing should be entered into by the two, and the same be filed in the office of the Public Service Commission for its approval.

Recommendations.

1. With respect to the Oak Street crossing in Plains Township, that the Wilkes-Barre Connecting Railroad Company and the Plains Township authorities be requested to enter into a written agreement, if possible, as to safety devices for the protection of the public at this grade crossing, and file the same in the office of The Public Service Commission for approval, or in lieu of it, the said railroad company be required to maintain gates at said crossing and to promptly light the same to the approval of the Commission. Furthermore, if at any time in the opinion of the Commission, the public convenience or necessity shall require the abolition of this grade crossing, then the Wilkes-Barre Connecting Railroad Company on order from the Public Service Commission, shall prepare plans and estimates of cost and suggestions as to the apportionment of said estimates of costs among the parties interested, and file the same with the Public Service Commission.

2. With respect to the proposed grade crossing at and near Mill Street in Miners Mills borough and Plains Township of Mill Street and the Wilkes-Barre Railway Company's trolley tracks by the proposed tracks of the Wilkes-Barre Connecting Railroad, that the proposed plans for said grade crossing be disapproved, and that the Wilkes-Barre Connecting Railroad Company be required to prepare plans and estimates of cost for avoiding said grade crossing of the highway and street railway, and endeavor to enter into an agreement, with the parties in interest, namely, Miners Mills borough, the township of Plains, the Wilkes-Barre Railway Company, the Lehigh Coal and Navigation Company, and the Central Railroad of New Jersey as to the proper apportionment of the cost of avoiding said grade crossing, and submit a report thereon, together with the plans, to the Public Service Commission as preliminary to a hearing or hearings to be given to all parties interested in the case, such report and plans to be filed not later than three months from the date of the order or permission.

3. That the written agreement between the Central Railroad Company of New Jersey, the Lehigh Coal and Navigation Company and the Wilkes-Barre Connecting Railroad Company relative to the construction of a portion of the said connecting railroad on the lands and right of way of the Lehigh and Susquehanna Railroad, including the so-called "Canal Branch" and for the avoidance of an existing grade crossing at or near the N. J. Healey's Breaker in Plains Township, etc., etc., copies of which are on file in the office of the Commission, be approved.

4. With respect to the crossing at grade by the tracks of the Wilkes-Barre and Eastern Railroad of the tracks of the Wilkes-Barre Connecting Railroad and the Delaware, Lackawanna and Western narrow gauge tracks as proposed, and the crossing at grade by the said narrow gauge railroad of the proposed track of the said Wilkes-Barre Connecting Railroad in Plains Township, that the plans be approved, and that the said connecting railroad company shall at its own cost and expense erect a tower and operate the same in connection with a system of interlocking signals for proper protection at the said crossings at grade. Plans and specifications for such safety protection to be prepared by the said connecting railroad company and to be submitted to and be approved, modified or amended by the Public Service Commission before final adoption and use by the Company.

5. With respect to the Main Street extension grade crossing in Plains Township and in connection therewith, the abandonment of an existing right of way at grade across the tracks of the Wilkes-Barre and Eastern Railroad by the substitution of a relocation paralleling the railroad and extending easterly to the said highway, that the plans be approved subject to the condition that the said Wilkes-Barre Connecting Railroad Company shall enter into a written agreement if possible, with Plains Township authorities relative to certain protective measures and safety devices to be provided by the said Railroad Company and file a copy thereof with the Public Service Commission for its approval; or in lieu of such agreement, that the said Railroad Company be required to properly light said crossing and to erect gates and operate and maintain them for the protection of the public at said crossing. Furthermore, that if at any time in the opinion of the Public Service Commission, the said grade crossing should be abolished, upon notice to this effect from the said Commission, said Railroad Company shall forthwith prepare plans and estimates of cost for such alteration or improvement and submit the same to the said Public Service Commission for approval, together with a report suggesting a proper apportionment of the costs among the parties interested.

6. With respect to proposed crossing above grade by the tracks of the Wilkes-Barre Connecting Railroad Company, the Wilkes-Barre and Eastern Railroad and the Delaware, Lackawanna and Western (narrow gauge), of the main line of the Lehigh Valley Railroad, Central Railroad of New Jersey (Canal Branch) and three breaker tracks of the Lehigh Valley Railroad Company in place of the existing crossing above grade at the same point in Plains Township of the tracks of the Wilkes-Barre and Eastern Railroad carried over on a single track bridge, that the general plans be approved as now filed in the office of the Public Service Commission, and that the Wilkes-Barre Connecting Railroad Company be required to file in the office of the said Commission detail plans of the abutments and piers and the superstructure proposed to be built with specifications therefor. The tracks supported by the bridge and for a suitable distance on either side shall be protected with guard rails.

7. With respect to the crossing above grade of River Street in Plains Township and the trolley line of the Wilkes-Barre Railway Company by the tracks of the Wilkes-Barre Connecting Railroad Company, the Wilkes-Barre and Eastern Railroad and the tracks of the Delaware, Lackawanna and Western (narrow gauge) in place of the existing crossing above grade of the Wilkes-Barre and Eastern Railroad, that the general plans on file in the office of the Public Service Commission be approved, that the Wilkes-Barre Connecting Railroad Company be required to file in the office of the said Commission detail plans of the proposed bridge and its supports with specifications therefor and that these plans and specifications shall provide for a tight bridge floor over the said highway or some proper protection of the highway underneath from material that might otherwise fall from the road-bed and tracks on the said highway. The tracks supported by the bridge and for a suitable distance on either side shall be protected with guard rails.

8. With respect to the crossing above grade of the tracks of the Lackawanna and Wyoming Valley Railroad (Laurel Line Electrical) and the standard gauge track of the Lehigh Valley Railroad (mine track) and the narrow gauge of the Lehigh Valley Railroad (mine track) in Plains Township, near the bank of the Susquehanna River, by the tracks of the Wilkes-Barre Connecting Railroad Company, the Wilkes-Barre and Eastern Railroad Company and the Delaware, Lackawanna and Western Railroad (narrow gauge) in place of the existing crossing above grade by the tracks of the Wilkes-Barre and Western Railroad, that the general plans on file in the office of the Public Service Commission be approved, that the Wilkes-Barre Connecting Railroad Company be required to file in the office of the said Commission detail plans of the proposed bridge and its supports with specifications therefor, and that the tracks supported by the bridge and for a suitable distance on either side shall be protected with guard rails.

9. With respect to the proposed bridge over the Susquehanna River and extending on to the flats in Dorranceton borough to carry the tracks of the Wilkes-Barre Connecting Railroad Company, the Wilkes-Barre and Eastern Railroad Company and the Delaware, Lackawanna and Western Railroad (narrow gauge) in place of the existing bridge that now supports the tracks of the Wilkes-Barre and Eastern Railroad, that the general plans on file in the office of the Public Service Commission be approved, that the Wilkes-Barre Connecting Railroad Company be required to file in the office of the said Commission detail plans of the proposed bridge and its supports with specifications therefor, these plans and specifications to include the approaches thereto with special reference to the approaches to be built or used by the said Wilkes-Barre and Eastern Railroad Company and the said Delaware, Lackawanna and Western Railroad (narrow gauge). The tracks supported by the bridge and on the approaches thereto and for a suitable distance on either side shall be protected with guard rails. In case of the improvement of navigation in the Susquehanna River by the State or Federal Government requiring a draw span or other change in the structure to facilitate navigation, the Wilkes-Barre Connecting Railroad Company shall first receive approval of the plans for such change, of the Public Service Commission, or shall make such changes as the said Public Service Commission may advise or approve.

10. With respect to the crossing above grade of Pierce Street and the trolley track of the Wilkes-Barre Railway Company in the borough of Dorranceton by the double track of the Wilkes-Barre Connecting Railroad Company, that the general plans on file in the office of the Public Service Commission be approved, that the agreement providing that the crossing may be built as planned which has been executed by the said Wilkes-Barre Railway Company and possibly the said borough authorities, be made a matter of record in the office of the Public Service Commission by the filing of certified copies of said agreements, that the Wilkes-

Barre Connecting Railroad Company be required to file in the office of the said Commission detail plans of the proposed bridge and its supports with specifications therefor and that these plans and specifications shall provide for a tight bridge floor over said highway, or some proper protection of the highway underneath from material that might otherwise fall from the roadbed above. The tracks supported by the bridge and for a proper distance on either side shall be protected with guard rails.

11. With respect to the crossing above grade of Market Street and the trolley tracks of the Wilkes-Barre Railway Company in Dorranceton borough, by the double track of the Wilkes-Barre Connecting Railroad Company, that the general plans on file in the office of the Public Service Commission be approved, that the agreement providing that the crossing may be built as planned which has been executed by the said Wilkes-Barre Railroad Company and possibly by the said borough authorities, be made a matter of record in the office of the Public Service Commission, by the filing of certified copies of said agreements, that the Wilkes-Barre Connecting Railroad Company be required to file in the office of the said Commission detail plans and specifications of the proposed bridge and its supports, and these plans and specifications shall provide for a tight bridge floor over said highway, or some proper protection of the highway underneath from material that might otherwise fall from the roadbed above. The tracks supported by the bridge and for a proper distance on either side shall be protected with guard rails.

12. With respect to the crossing above grade of Northampton Street, which is the boundary line between the boroughs of Dorranceton and Edwardsville by the double tracks of the Wilkes-Barre Connecting Railroad Company, that the general plans on file in the said Public Service Commission be approved, that copies of any agreements that may have been executed between the said Connecting Railroad Company and the authorities of said borough providing for the construction of the crossing as proposed, be made a matter of record in the office of the said Public Service Commission by the filing of certified copies of such agreements in the office of said Commission, that the Wilkes-Barre Connecting Railroad be required to file in the office of the said Commission, detail plans and specifications of the proposed bridge and its supports, and that these plans and specifications shall provide for a tight bridge floor over said highway, or some proper protection of the highway underneath from material that might otherwise fall from the roadbed above. The tracks supported by the bridge and for a proper distance on either side shall be protected with guard rails.

13. With respect to the proposed bridge over the Susquehanna River and over the Riverside Boulevard in South Wilkes-Barre to carry the tracks of the Wilkes-Barre Connecting Railroad, that the general plans on file in the office of the Public Service Commission, be approved; that the Wilkes-Barre Connecting Railroad Company be required to file in the office of said Commission detail plans and specifications of the proposed bridge and its supports and that these plans and specifications shall provide for a tight bridge floor over the said Riverside Boulevard or some proper protection of the highway underneath from material that might otherwise fall from the roadbed above; the tracks supported by the bridge and for a proper distance on either side shall be provided with guard rails. In case of the improvement of navigation in the Susquehanna River by the State or Federal Government requiring a draw span or other change in the bridge to facilitate navigation, the Wilkes-Barre Connecting Railroad Company shall first receive approval of the plans for such a change of the Public Service Commission, or shall make such change as the said Public Service Commission may advise or approve.

14. With respect to the proposed relocation of Pickering Street in South Wilkes-Barre to avoid intersecting of West Academy and Birch Streets by the Wilkes-Barre

Connecting Railroad, that the general plans on file in the office of the Public Service Commission be approved, and that certified copies of the agreement between the city of Wilkes-Barre and the said Connecting Railway Company and the owners of the land effected shall be submitted to the Public Service Commission for approval and be approved, modified or amended by the said Commission before the work is done.

15. With respect to the proposed crossing of Miner Street and Maffet Street, or rather extensions of said streets west of Pickering Street in South Wilkes-Barre, either by embankment fill or by crossing above grade with bridges supporting three parallel tracks of the Wilkes-Barre Connecting Railroad Company, that before the work is done, and as soon as an agreement as to plans by which the work shall be done shall have been entered into between the said Wilkes-Barre Connecting Railroad Company, the city of Wilkes-Barre and the land owners affected, a copy of such agreement properly certified shall be submitted to the Public Service Commission for approval. Whatever the results of negotiations now going on as to plans by and between the said parties mentioned, the Wilkes-Barre Connecting Railroad Company shall do no work at and across the two said street extensions until detail plans thereof and specifications shall have been submitted to the Public Service Commission by the said Railroad Company and have been approved, modified or amended by said Commission.

16. With respect to the proposed crossing above grade of Amherst Avenue in South Wilkes-Barre by the three parallel tracks of the Wilkes-Barre Connecting Railroad, that the general plans on file in the office of the Public Service Commission be approved; that the said Wilkes-Barre Connecting Railroad be required to file in the office of the said Commission detail plans and specifications of the proposed bridge and its supports, and that these plans and specifications shall provide for a tight bridge floor over said highway, or some proper protection of the highway underneath from material that might otherwise fall from the road bed above. The tracks supported by the bridge and for a proper distance on either side shall be provided with guard rails. Any agreement that may be concluded between the said company and the city of Wilkes-Barre and the land owners affected which may relate to the plans by which said crossing of Amherst Avenue is to be constructed, shall be submitted to the Public Service Commission for approval and certified copies of any agreement already executed relative to this crossing shall be filed in the office of the said Commission.

17. With respect to the proposed crossing above grade of Marlborough Avenue in South Wilkes-Barre by the three parallel tracks of the Wilkes-Barre Connecting Railroad, that the general plans on file in the office of the Public Service Commission be approved; that the said Wilkes-Barre Connecting Railroad Company be required to file in the office of the said Commission detail plans and specifications of the present bridge and its support and that these plans and specifications shall provide for a tight bridge floor over said highway, or some proper protection of the highway underneath from material that might otherwise fall from the roadbed above. The tracks supported by the bridge and for a proper distance on either side shall be provided with guard rails. Any prior agreement or any agreement that may be concluded between the said company and the city of Wilkes-Barre and the land owners affected, which may relate to the plans by which said crossing of Marlborough Avenue is to be constructed, shall be submitted to the Public Service Commission for approval.

18. With respect to the proposed crossing above grade of the existing three parallel tracks of the Northern Coal and Iron Company's Plymouth Branch Railroad by the double tracks of the Wilkes-Barre Connecting Railroad Company in South

Wilkes-Barre; that the general plans on file in the office of the Public Service Commission be approved; that the said Wilkes-Barre Connecting Railroad Company be required to file in the office of said Commission, detail plans and specifications of the proposed bridge and its support. The tracks supported by the bridge and for a proper distance on either side shall be provided with guard rails.

19. With respect to the alteration of the existing above grade crossing of Dagobert Street in South Wilkes-Barre by the tracks of the Railroad of the Northern Coal and Iron Company (Buttonwood Branch), such alterations to consist of widening and raising the embankment approaches to the bridge and raising the bridge and laying thereon parallel tracks by the Wilkes-Barre Connecting Railroad Company, and the raising and widening and otherwise improving the existing piers and abutments to the overflow bridge adjacent to and northerly of Dagobert Street and to double track the road over said proposed bridge and its approaches, that the general plans on file in the office of the Public Service Commission be approved; that detail plans of the grade and abutments as they are to be built at Dagobert Street proposed to be built, shall be filed in the office of the Public Service Commission; by the said Wilkes-Barre Connecting Railroad Company and said Company shall provide proper protection of the highway at Dagobert Street from material that might otherwise fall upon the street from the railroad above. The tracks supported by the said Dagobert Street bridge and by the said overflow bridge and for a proper distance on either side of said bridges shall be protected with guard rails.

20. With respect to the alteration of existing above grade crossing of Horton Street in South Wilkes-Barre by the tracks of the railroad of the Northern Coal and Iron Company (Buttonwood Branch), such alterations to consist of widening and raising the embankment approaches to the bridge and raising the bridge and laying thereon parallel tracks by the Wilkes-Barre Connecting Railroad Company, that the general plans on file in the office of the Public Service Commission be approved; that detail plans of the bridge and abutments as they are to be built at Horton Street shall be filed in the office of the Public Service Commission by the said Wilkes-Barre Connecting Railroad Company, and said Company shall provide proper protection at the highway at Horton Street from materials that might otherwise fall upon the street from the railroad above. The tracks on said bridge and for a proper distance on either side of said bridge shall be protected with guard rails.

21. With respect to the double tracking of the road bed and existing above grade crossing of Lawrence Street in South Wilkes-Barre by the Wilkes-Barre Connecting Railroad Company, that the general plans on file in the office of the Public Service Commission be approved; that the said Connecting Railroad Company shall file in the office of the Public Service Commission detail plans of said bridge and its abutments, and said company shall provide proper protection of the highway at Lawrence Street from the railroad above. The tracks of said bridge and for a proper distance on either side of said bridge shall be provided with guard rails.

22. With respect to the double tracking of the roadbed and existing above grade crossing of Oak Street in South Wilkes-Barre by the Wilkes-Barre Connecting Railroad Company, that the general plans on file in the office of the Public Service Commission be approved; that the said connecting Railroad Company shall file in the office of the said Public Service Commission detail plans of said bridge and its abutments, and said company shall provide proper protection of the highway at Oak Street from the railroad above. The tracks on said bridge and for a proper distance on either side of said bridge shall be provided with guard rails.

23. With respect to the double tracking of the roadbed and existing above grade crossing of Willow Street in South Wilkes-Barre by the Wilkes-Barre Connecting Railroad Company, that the general plans on file in the office of the Public Service Commission, be approved; that the said Connecting Railroad Company shall file in the office of the Public Service Commission detail plans of said bridge and its abutments, and said company shall provide proper protection of the highway at Willow Street from material that might otherwise fall upon the street from the railroad above. The tracks on said bridge and for a proper distance on either side of said bridge shall be provided with guard rails.

24. With respect to the double tracking of the road bed and existing above grade crossing of Simpson Street in South Wilkes-Barre by the Wilkes-Barre Connecting Railroad Company, that the general plans on file in the office of the Public Service Commission, be approved; that the said Connecting Railroad Company shall file in the office of the said Public Service Commission detail plans of said bridge and its supports, and said company shall provide proper protection of the highway at Simpson Street from material that might otherwise fall upon the street from the railroad above. The tracks on the said bridge and for a proper distance on either side of said bridge shall be provided with guard rails.

25. With respect to the double tracking of the roadbed and above grade crossing of Carey Avenue in Hanover Township by the Wilkes-Barre Connecting Railroad Company, that the general plans on file in the office of the Public Service Commission, be approved; that the said Connecting Railroad Company shall file in the office of the Public Service Commission detail plans of said bridge and its supports and said company shall provide proper protection of the highway at Carey Avenue from material that might otherwise fall upon the avenue and tracks of the Wilkes-Barre Connecting Railroad Company from the railroad above. The tracks on said bridge and for a proper distance on either side of said bridge shall be provided with guard rails.

26. With respect to the proposed crossing at grade of the Plymouth Ferry Road by the existing tracks of the Buttonwood Branch of the Northern Coal and Iron Company and the proposed tracks of the Wilkes-Barre Connecting Railroad Company, that the general plans on file in the office of the Public Service Commission, be approved subject to the condition that the said Wilkes-Barre Connecting Railroad Company shall forthwith upon order by the Public Service Commission so to do, install, operate and maintain at said crossing such gates or other protective devices as the said Commission shall order or approve; and subject to such further conditions that if at any time in the opinion of the Public Service Commission the public convenience and necessity requires, that the said grade crossing shall be abolished, then upon notice to this effect from the said Commission, said Railroad Company shall forthwith prepare plans and estimates of cost for such alteration or improvement and submit the same to the said Public Service Commission for approval, together with a report suggesting a proper apportionment of the costs among the parties interested.

It is suggested that the Wilkes-Barre Connecting Railroad Company is required to furnish the Public Service Commission items of cost of each bridge and its abutments and piers and such other items of engineering cost as may be properly recorded in the office of the Public Service Commission for future reference.

Certificates of public convenience were issued by the Commission May 21st, 1914, subject to certain conditions appearing elsewhere in the report of the Commission, and substantially as stated above under recommendations.

9. WIRE CROSSINGS.

a—Lehigh Navigation Electric Company.

In this case the Lehigh Navigation Electric Company makes application for a Certificate of Public Convenience for an overhead crossing of the tracks and wires of the Slate Belt Electric Railway Company and the Pennsylvania Utilities Company near the village of Belfast in Plainfield Township, Northampton County. The Pennsylvania Utilities Company objects. The said Lehigh Company wishes to construct the crossing consisting of a 300 foot span supported by specially constructed towers at each end to carry high tension wires, the ground wires and telephone wires. The wire at the top of the towers is a 3-8" steel ground wire. Below the top wire are three 2-0 copper conductors on each side. Below and some 10 feet or more is the telephone wire. The details of the tower conform to the requirements of the specifications of the American Railway Association, and are of the same construction as the other towers of the Lehigh Company along the transmission line. The Lehigh Company claims that the 300 foot span is not a long one. There is on the same line a span 767 feet in length. As thus far constructed, the transmission line from Hauto has 21 crossing spans over railroads, telephone lines, transmission lines and trolley lines, the average span being 404 feet. The span lengths have been determined largely by the topography of the territory, and with the idea of obtaining sufficient vertical clearances. Thirteen of the crossings are over railroads, 5 over electric trolley lines and 3 over telephone and transmission lines.

The height of the lower wire at the proposed crossing, above the highest wire of the Pennsylvania Company is 17 feet 2 inches. The power wire of the Pennsylvania Company transmits 33,000 volts. The lower wire of the Lehigh Company is 22,000 voltage. The telephone wire is 7 feet above the ground wire of the Pennsylvania Company transmission line. It is claimed by the Lehigh Company that there is no likelihood or reasonable probability of any damage or danger being caused to the property of the Pennsylvania Utilities Company by the way and manner in which the proposed crossing is to be built. There are on the wooden pole lines of the Pennsylvania Company 6 conductors and 1 ground wire. There are on the Lehigh Company's line 6 conductors, 2 telephone wires and 1 ground wire.

The power station of the Lehigh Company is at Hauto, 36 miles west of the crossing in question. Martins Creek, the objective point of the line is 5 miles east of the proposed crossing. The main feeder at the said power station as constructed is stranded copper cable of 110,000 voltage. Some of the spans along this high transmission line of the said Lehigh Company are shown in the following table:

Over Easton, Pa., Railway trolley,.....	span 767 feet, voltage 110,000
Over Lehigh Valley Transit Co. trolley,.....	span 615 feet, voltage 110,000
Over Lehigh Valley Transit Co. trolley,	span 512 feet, voltage 110,000
Over Northampton Traction Co. trolley,.....	span 220 feet, voltage 222,000
Over Central R. R. of N. J. at Lehigh River,.....	span 275 feet.
Over D. L. & W. Crossing,.....	span 248 feet.
Over Central R. R. of N. J. near sub-station,.....	span 127 feet.
Over Lehigh Valley R. R. near river,.....	span 196 feet.

The minimum vertical distance between wires crossed is 7 feet.

With respect to the crossing in question, the Lehigh Company maintains that if the transmission wire should break it would fall, striking the one below it and cause short circuit. The circuit breakers would go out and thus shut off the power. The time limit relays at the station would open the circuit in perhaps 3 seconds, and this opening of the circuit breakers would not cause any damage.

It is the practice of the company to place the towers as close to the side of the road as practicable so as to shorten the span there. Usually long crossing spans are avoided. There is a 10 foot vertical space provided between wires transmitting 110,000 volts.

The wires at the crossing proposed are anchored dead ended on the suspension insulators, so that the approaching spans on each side, if the wires break, it will not affect the road span. The towers are self-supporting, in case all the wires break on one side they will take the entire strain of the pull. However, the length of the span is not the great factor, if proper clearance above the other wires is provided and not too great tension on the wires is assured, so the Lehigh Company asserts. The weight of wire is what causes the tension. So long as tension does not exceed a certain amount, it makes no difference what causes the weight or pull; but taken to its ultimate conclusion, the longer a wire span, the more likely it is to break. A 300 foot span in sleet storms will collect more weight and carry a greater load than a 50 foot span, and also wind load and resulting stresses are greatly increased the longer the span. It is not customary to build towers sufficiently high so that the lowest wire on them, if it were to break, will swing clear of the wires crossed below. The towers at the proposed crossing are the highest on the entire line. It is not feasible to put the wires at the proposed crossing under ground. A combination of overhead with occasional underground connections is accompanied with great difficulty in insulation.

From Hauto to Siegfried, where is the first substitution, the voltage line transmits 110,000 volts. From Siegfried east to a point north of Nazareth borough, which is not far distant from the crossing in question, the towers and cables have been put up in contemplation of a 110,000 volt transmission line at some future time. Beyond this point, the insulation is for 22,000 volts.

The said Pennsylvania Company looks upon Plainfield Township and other townships within a certain radius of Easton where its generating station is located, as its own preempted territory, and hence this case is one of peculiar concern to both competing companies, and really the gist of the matter is not so much with respect to the manner in which the physical crossing proposed shall be made, but one of greater significance. Shall the application be for a permit to construct a crossing, or shall it involve the question that lies behind it—whether the Lehigh Company has the right to cross the wires of the Pennsylvania Company in any manner, whatsoever?

The Lehigh Navigation Company was incorporated in April, 1911. Thirty-eight township companies covering Hauto in the anthracite coal region to Martins Creek on the Delaware River, where is located the Alpha Portland Cement Works, were incorporated, merged and consolidated into one company, December, 1912, so that the said Lehigh Company has the right to supply heat, light and power in Lower Mt. Bethel Township, Northampton County, where the Alpha Portland Cement Works are located, and in the other territory of the said townships. The Lehigh Company contracted with the Alpha Portland Cement Company to furnish power and built its line up to the proposed crossing and is ready for delivery of power, except for one missing link in the line, namely, at the point for which the crossing is now asked. The Lehigh Company maintains that it is absolutely essential that

the company shall have the privilege of constructing its line for the transmission of power, or it is impossible for it to fulfill the purposes for which the company was created. The Commission can compel the company to construct and extend its line to all parts of the territory it is authorized to serve. Hence, so the Lehigh Company maintains, the Certificate of Public Convenience asked for is precedent to commencement of service and it involves, therefore, simply the question of the physical crossing.

The said Lehigh Company argues that no electric light, heat and power company has an exclusive franchise such as the Pennsylvania Utilities Company. It may have exclusive right under contract, but no exclusive franchise in absence of such contract. Where the crossing is granted, the terms of the certificate of the Commission protect the company crossed and the public. The crossing shall be safe and in accordance with proper practice. Only the question of the making of the crossing is before the Commission. The purposes of the crossing is irrelevant. The Commission, so it is alleged by the Lehigh Company, cannot say to the operating company, "you cannot cross the line of another" because that is a power inherent in that company; but the Commission can say to the operating company, that the crossing proposed is not safe or convenient and that the crossing shall be built in such manner as it may prescribe. In other words, the crossing cannot be prevented, provided the petitioning company shall build it in such safe and proper manner as the Commission shall determine.

On the other hand, the Pennsylvania Company maintains that the object or purpose of the crossing must enter into the question to be considered by the Commission. The existing company with its wires already strung, can meet the demands of the territory it covers, and is subject to orders of the Commission for extension and regulation of service and rates. If a foreign company without any plant or facilities in the territory asks for permission to enter the territory, and in so doing, must cross the facilities of the existing company, it is essential that such petitioning company shall show the necessity for such crossing. The Commission is bound to consider the ultimate end, or object, or purpose.

The Certificate of Public Convenience has several meanings in the act. The Commission may go into the question sufficiently to find out whether there is a legitimate purpose behind the petition sufficient to justify the crossing. The question of safety in the manner of making the crossing is comparatively insignificant. Back and higher is the question of public interest. The consumer is the one who is weakest and needs most protection, for where competition leads to the duplication of plant and the multiplication of capitalization and divided territory, the public is bound to be subjected to rates and service that are ultimately unsatisfactory to all concerned. When a corporation is in possession of territory and has made large capital investments and has reasonably supplied the public with service, subject to the vicissitudes of ordinary business operations, the people on the whole are better served by one company under the prudent direction of the Commission, than under competitive conditions. The questions, therefore, for the Commission to consider are: What does the new company want? What is it trying to do?

So it appears that the opposition to the crossing by the Pennsylvania Utilities Company hinges upon the interpretation of the term "Certificate of Public Convenience" in the Public Service Company Law.

The Commission decided that its jurisdiction in this case relates to the construction and devices that shall be employed at the proposed crossing, in order to make the crossing safe to the public and protect the property of the companies crossed.

It was recommended:

1. The existing towers supporting the crossing-span proposed (they being denominated on the plan as Tower No. 19 and Tower No. 20), shall be moved eastward to within ten feet of the westerly line of the highway, and Tower No. 20 shall be moved westward to within ten feet of the easterly line of the highway, thereby providing for a horizontal clearance between the base of the said towers of approximately fifty-seven feet.

2. The said towers supporting the crossing-span shall be of such height as to give a vertical clearance of ten feet between the lowest wire of the Lehigh Navigation Electric Company's line, and the highest wire of the Pennsylvania Utilities Company's line, as it existed prior to January 25th, 1914, on or about which time two temporary poles were erected and wires were strung at said crossing by the Pennsylvania Utilities Company, which said wires are approximately on a level with and obstruct the crossing-span of the Lehigh Navigation Electric Company, hereby and herein approved, which said wires are to be taken down and replaced at the same level as they were prior to January 25th, 1914.

3. The adjoining span on each side of the crossing-span shall be in a straight line with said crossing-span, but on the line to the east and about half way between Tower No. 20 and Tower No. 21, shall be erected and maintained a flexible "A" frame tower, similar in design and construction to other flexible towers now installed along said line.

4. If at any time in the opinion of The Public Service Commission of the Commonwealth of Pennsylvania, it is desirable or necessary to raise the height of the towers, or to change the span, or to make any other alterations or improvements at or in connection with said modified crossing of the transmission lines of the Lehigh Navigation Electric Company with the transmission lines of the Pennsylvania Utilities Company, at the crossing hereby and herein approved, then the Lehigh Navigation Electric Company shall forthwith make such changes or improvements as The Public Service Commission of the Commonwealth of Pennsylvania may advise or approve.

b—Central Railroad of New Jersey.

In the matter of the application by the Pennsylvania Utilities Company for a permit to construct an overhead wire crossing over the tracks and railroad facilities of the Central Railroad of New Jersey at what was formerly Glendon, Palmer Township, and now is West Easton borough, Northampton County, the following report was made.

The Pennsylvania Utilities Company now operates and maintains a central station in the city of Easton for the purpose of generating electricity for light, heat and power, and is extending and improving this station and has constructed a high tension transmission line westerly along the river road for the purpose of supplying the public in Palmer Township and elsewhere. Just beyond the city line in the borough of West Easton, it is necessary to leave the said river road, which follows along the northern bank of the Lehigh River, and to cross the tracks of the Central Railroad of New Jersey which also parallels the said river, in order to reach the territory to the north that is to be served.

Somewhere in the valley it is necessary that a crossing shall be made of the tracks of the said railroad, otherwise the transmission line will be confined to the river bank. The Central Railroad of New Jersey has entered into an agreement with the said Pennsylvania Utilities Company relative to the manner in which the proposed crossing shall be constructed and maintained. The agreement is dated March 25th, 1914, and copies of it have been filed in the office of the Commission. It is stipulated in the agreement that the agreement shall not become effective until approved by the Public Service Commission.

The Central Railroad Company of New Jersey leases the tracks covered by the agreement in question of the Lehigh Coal and Navigation Company. The said navigation company owns a strip of land at the point of the proposed crossing 120 feet wide. This company has stated that the tracks, etc., leased to the Central Railroad Company of New Jersey are confined to an area 60 feet in width, leaving a strip on either side thereof, of approximately 30 feet, which are the private property of the said navigation company, to the same extent and with the same effect as if they were owned by an individual or corporation, because they were not included in the lease to the Central Railroad Company of New Jersey, and are not necessary for the operation of a railroad. Furthermore, the navigation company objects to the crossing of these two 30-foot strips, or did on April 20, 1914, in a communication addressed to the Secretary of the Commission.

On the ground at the site of the proposed crossing, the Pennsylvania Utilities Company has erected two steel towers, one on either side of the 120 foot strip of land, and that these towers are located on land owned by the said utilities company, or leased for right-of-way purposes. The hillside here is very steep. There is scant room. The highway stretches along the bank of the river, and in this road are the tracks of the Easton Transit Company which extend up stream a mile or so to Island Park. Abutting the highway is a strip of land about 100 feet wide occupied by dwellings. Then comes the 120 foot right of way of the railroad company. There are four parallel tracks here elevated approximately 30 feet above the level of the river road. Thence there is a precipitous hillside along the top of which there is a highway distant about 120 feet from the railroad location. This strip is so steep in slope that it remains unoccupied. The highway above, is approximately 100 feet above the level of the railroad tracks.

The Pennsylvania Utilities Company has erected a pole in the highway at the top of the hill. There is a span of 130 feet between this pole and the nearest steel tower. The span across the railroad tracks between the two steel towers is 138 feet in length. The span between the second steel tower and the pole erected on the utility company's land at the river road is about 100 feet. The two steel towers and the wooden poles next beyond them are in a straight line. There will be a vertical clearance of over 50 feet between the tracks of the railroad company and the lowest wire of the utilities company, and there will be a vertical clearance of about 18 feet between the wires of the said companies.

Along the river road are the poles and wires of the Bell Telephone Company, the Easton Transit Company and the Pennsylvania Utility Company. The poles and wires of the Bell Telephone Company are to be taken down and moved to the south bank of the river, in conformity with an agreement existing between the said telephone company and utilities company. Hence the present arrangement of these wires and poles need not be further discussed.

Recommendations.

It was recommended:

1. That the proposed crossing shall be constructed in conformity with the general plans and specifications accompanying the application for said crossing and on file in the office of The Public Service Commission of the Commonwealth of Pennsylvania, and, with respect to details, in conformity with the standard specifications for such crossings of the American Railway Association.

2. After the crossing shall have been constructed, the Pennsylvania Utilities Company shall, within 30 days, file in the office, of the said Public Service Commission, detail plans and a satisfactory description of the crossing as constructed and the connecting lines, poles and facilities for a distance of several hundred feet on either side of the said crossing.

3. If at any time, in the opinion of The Public Service Commission of the Commonwealth of Pennsylvania, it is desirable or necessary to make any alterations or improvements at or in connection with said crossing hereby and herein approved, then the Pennsylvania Utilities Company shall forthwith make such changes or improvements as the said Public Service Commission may advise, order or approve.

c—Raystown Water Power Company.

1—Williamsburg.

The Raystown Water Power Company purposes to build its line and to cross under the wires of the Penn Central Light and Power Company in Catharine Township, Blair County, at two points. In the report which follows, these crossings are designated as A and B. B is in the vicinity and near the old tow-path bridge over the Juniata River.

The Juniata River is the boundary line between Catharine Township to the north and Woodbury Township to the south. Williamsburg Borough is in the latter township. It is supplied with light by the Raystown Water Power Company. The Penn Central Light and Power Company has been erecting an auxilliary plant in Williamsburg for the purpose of a manufacture and sale of electric light and power to a district of considerable extent, in Blair and Huntingdon Counties and has in connection with this development constructed a high tension transmission line through Woodbury Township. It was the Company's intention to locate this line entirely south of the river; but failing to secure the necessary right of way at one farm, it was compelled to cross the river and to pass through a portion of Catharine Township for a distance of about seven hundred feet in length and thence by a second crossing of the river to enter Woodbury Township again. The first crossing designated as "A" is near the village of Ganister. Along the southerly bank of the river at this point are the tracks of the Pennsylvania Railroad and paralleling the said tracks is a public highway. The said transmission line of the Penn Central Company has been constructed over this highway and railroad and the river under an agreement specifying the form of construction of said crossing which form is in conformity with the general specifications of the Pennsylvania Railroad Company for all similar crossings.

The towers supporting the river span are made of steel. The one on the north bank is strengthened by proper construction, as shown in the photographs and plans filed with the Commission. This is made necessary because the alignment deflects to the right about thirty degrees at this point. The tower is located at the top of the old tow-path embankment and the lower wires (telephone wires) are 22' 6" from the surface of the ground.

Fifteen feet distant from this pole towards the river bank there was erected by the Raystown Company a wooden pole 30' high from the surface of the ground. At that point the ground is 9' lower than the top of the tow path where the Penn Central Company's pole is erected, hence the top of the 30' pole is 1' 6" lower than the telephone wires, or would be if the pole had not been cut down by the Penn Central Company. The Raystown Company was forced to seek this low land on the river bank because it was the only location where it could secure a right of way to cross the wires and facilities of the Penn Central Company.

After the pole was erected and equipped there was a ground wire at the top. The pole was chestnut 30' above ground and 5' underground, 8" diameter at the top. Four feet from the top was an arm supporting the conductor, and 4' below this arm was a second arm supporting two conductors spaced 7' apart and 2½' lower down was an arm supporting parallel telephone lines. The transmission line

was insulated for forty-five thousand volts. The line voltage at the present time will be twenty-three hundred. Owing to the difference in elevation of the ground at the base of the two poles, a man might stand on the edge of the tow-path and reach the nearest transmission line on the Raystown Company's pole with a rod 12' long.

Furthermore, this wooden pole is located where it may be damaged by a freshet and ice floe.

The Penn Central's tower should be elevated so as to give a vertical clearance between the lowest wire on its pole and the highest wire on the Raystown Company's pole of at least 8'. Still further, the steel tower should be moved over to the north so as to provide room for the erection of the pole and line of the Raystown Company on ground not subject to inundation; and finally, the Raystown Company should be required to conform its construction for transmission lines of forty-five thousand volts to the standard specifications set forth in the report of the joint committee on high tension crossings on the American Institute of Electrical Engineers.

These suggestions are all the more important since the crossing is to be a permanent one.

The Raystown Company's transmission line from Williamsburg passes westerly into Catharine Township. When the Joseph Winter farm was reached, passage across it was stopped because the Penn Central Company had acquired control of the farm. This company had also obtained control of a narrow strip of land for a mile or more to the north and also to the south of the river, effectually preventing the construction by the Raystown Company of its transmission line westward, with the exception of the right of way over the land of the Pennsylvania Railroad, a narrow strip bordering the river along the north bank. This right was secured by the Raystown Company. At crossing "b" the Penn Central Company has a tower erected on the river bank, and has strung its wires spanning the river, the lowest or telephone lines at the tower are 22' above the surface of the ground, which is low here and subject to flood in high water. This tower is of special construction as the alignment deflects on the right about 45 degrees. The pole nearest the river is directly at the bank. The Raystown Company proposes to erect its transmission pole on ground 8' lower which brings the location of it into the channel of the river. There will be a vertical clearance of 12' only between the transmission wire of the Raystown Company and the steel tower of the Penn Central Company. It is proposed by the Raystown Company to place the ground wire at the top of the pole and provide a vertical clearance between it and the telephone wires of the Penn Central Company of 8'. This will bring the three transmission wires to within 9' of the surface of the ground at the steel pole. About 100' up stream where the old bridge abutment was located and where the tow path embankment now exists, the pole to be erected there on the edge of the river channel will carry the transmission wire about level with the surface of the ground. To remedy this, the said embankment and tow-path bridge abutment should be removed in the vicinity and the ground leveled off, but even then the wires will be altogether too low.

The steel tower should be moved further back from the river and be carried up sufficiently high to afford 8' clearance of the nearest wire on the pole of the Raystown Company when this pole and its complement shall have been erected on ground away from the river channel and not subject to ordinary inundation. The form of construction to be adopted by the Raystown Company should be in conformity with the standard specifications hereinbefore mentioned.

Recommendations.

The two crossings "A" and "B" are unnecessary and they should be avoided. The Raystown Company is compelled to seek the banks of the river and to cross the lines of the Penn Central Company at two points when it wished to avoid altogether the line of the Penn Central Company and to pass up the valley many hundred feet to the north. There is nothing to hinder this avoidance of two crossings now except the wilfulness of the Penn Central Company. If it be made apparent to the Penn Central Company that the Raystown Company will be permitted to build its line westward up the valley of the Juniata, and that it will be a matter of economy for the Penn Central Company to permit the Raystown Company to pass up the valley with the transmission line at a point hundreds of feet north of the Penn Central Company's line in Catharine Township rather than to compel the Raystown Company to cross the wires of the Penn Central Company, possibly the difference may amicably be adjusted and the two needless crossings entirely avoided.

It is suggested that the Commission make an effort to bring about this result, or in lieu of it that the Raystown Water Power Company be required to change the location of its proposed line from the edge of the channel to the high ground, and to conform its construction to the standard specifications as reported by the joint committee on high tension crossings of the American Institute of Electrical Engineers, and file its plans for approval with the Commission.

Also that the Penn Central Company, in lieu of its granting a right of way across its other land to the Raystown Company, shall change the location of its towers at any of the river crossings in Catharine Township so as to permit the Raystown Water Power Company transmission line to be constructed along the tow-path in said territory according to location plans, approved by The Public Service Commission. Furthermore, the Penn Central Light and Power Company shall elevate its poles at the said crossings in conformity with plans to be approved by The Public Service Commission in order to give a clearance of 8' between its lowest wires and the highest wire of the Raystown Water Power Company line at the crossings proposed.

2—Mapleton.

The Penn Central Light and Power Company is a powerful corporation. Its main generating plant is located in the city of Altoona; another generating plant is located on the Juniata River at Warrior's Ridge. Here a dam has been constructed, and when there is sufficient water, the electric current is produced by water power. During seasons of drought the deficiency in current is made up by an auxiliary steam plant. The territory served by the Company is most extensive. It includes portions of Cambria, Indiana, Clearfield, Blair, Huntingdon, Mifflin and Juniata Counties. In Huntingdon County, on the Raystown Branch of the Juniata River, the Raystown Water Power Company has erected a large dam and generating station. This Company has also secured the right for the erection of two other dams on the same stream, which when built, will have developed the water power of this stream to its maximum capacity. The operations have been projected, and a plant has been erected thus far largely by local capital. The competition, particularly in Huntingdon and Blair Counties, between these two corporations is very keen.

At a point in Union Township, Huntingdon County, near the Borough of Mapleton, where the service line of the Penn Central Company, crossed the public road known as Hare's Valley Road (near the plant of the Pittsburgh White Sand Com-

pany) and also at a point where the Penn Central Light and Power Company service line crosses the aforesaid road (near the quarry of the Juniata White Sand Company) the Raystown Company proposes to build its line under the wires of the said Penn Central Light and Power Company.

The proposed line of the Raystown Water Power Company is to have a voltage of 2300. At each crossing there is to be a vertical clearance of 3 feet between the lowest wires on the pole of the Penn Central Company (which wires are parallel telephone lines), and the highest wire on the pole of the said Raystown Company. According to the plan there will be a vertical clearance between the lowest wire of the said Raystown Company and the surface of the ground of the proposed crossing, of twenty feet.

Recommendations.

(1) That the Raystown Water Power Company shall file a satisfactory plan and elevation of each crossing as constructed, showing the highway and property lines and poles and the lines of wires of the Penn Central Light and Power Company and the Raystown Water Power Company at and in the vicinity of each of the said crossings.

(2) That if, at any time, in the opinion of the Public Service Commission it is desirable that said crossings shall be changed, then upon order to make a change the Raystown Water Power Company shall forthwith comply with such order of The Public Service Commission.

3—Mount Union.

The Raystown Water Power Company proposes to build certain lines of wires in the Borough of Mt. Union, Huntingdon County, under the existing wires of the Penn Central Light and Power Company.

The Penn Central Light and Power Company's house service wires, distribution wires, steel light supporting arm and distribution wires, on or near the southern side of Shirley Street, at its intersection with Division Street north of Shirley Street, are to be crossed by the primary wire (2200 volts) and the secondary wires (one of 220 and one of 110 volts), of the Raystown Water Power Company, all three of said lines of the Raystown Company being supported on a single cross arm attached to a chestnut pole and providing a vertical clearance of not less than 3 feet between the lowest wires of the Penn Central Company and the said wires of the Raystown Company, and providing a vertical clearance of about 20 feet between said Raystown Company's wires and the surface of the street beneath.

On Small Alley east of Division Street on the north side are the poles of the Penn Central Company, and on the south side are the poles of the Postal or some other telegraph or telephone company. The poles of the Raystown Water Power Company cross the tracks of the Pennsylvania Railroad, and pass southerly along the easterly side of Division Street. There will be a crossing at the northeast corner of Division Street and said Small Alley of the wires of these two companies.

The Raystown Company's pole nearest the railroad is high, being made so in order to cross the said railroad tracks in conformity with the Pennsylvania Railroad Company's standard specifications. The line will have to be dropped at this pole, so as to pass under the wires of the Penn Central Company. From a pole to be erected on the southeast corner of the said Division Street and the Small Alley, thence the line proposed by the Raystown Company will extend easterly along the south side of the alley, passing under three (3) house service wires of

the Penn Central Company. In each case there is to be a vertical clearance of 3 feet between the wires of the Penn Central Company and the wires of the Raystown Company, and there will be about 20 feet vertical clearance between said Raystown Company's wires and the surface of the ground. There are to be three (3) wires on the pole of the Raystown Company, supported on one cross arm; they to be respectively 2300, 220 and 110 volts.

On Wood Street which runs north from Shirley Avenue, the Penn Central Company has a line of wires. The Raystown Company proposes to construct its wires of the same voltage and arrangement as hereinbefore described under the wires of the Penn Central Light and Power Company, so as to give a vertical clearance of three (3) feet between the secondary lines of the Penn Central Light and Power Company and the wires of the Raystown Company, and so as to give a vertical clearance of the latter from the surface of the road, of about 20 feet. Wood Street is in the outskirts and it is not so much travelled or built up.

The Penn Central Company has a line of wires on the east side of Jefferson Street. The Raystown Company purposes to construct a line southerly along Academy Alley, crossing over the wires of the Penn Central Company at Jefferson Street, so as to give a vertical clearance of three (3) feet. On the pole of the said Penn Central Company there are to be three wires supported on one arm, as hereinbefore described. In the same alley are two lines of telephone and telegraph poles, supporting many lines of wire, but they are on higher poles and are carried high over all other wires.

Jefferson Street runs north and south and is a thoroughfare thoroughly built up. Along the east side, the Penn Central Company has a line of poles supporting primary and secondary wires. The secondary wires are twenty feet six inches above the surface of the street. The Raystown proposes to pass under the secondary wires with a clearance of twelve inches only, as shown on the original plan filed with the application but now modified to give a clearance of twenty-four inches. There is a house service wire passing obliquely across Jefferson Street here. The wires of the Raystown Company are to pass over the service wires with a clearance of eighteen inches. In the alley west of Jefferson Street the Penn Central Company has a service wire over which the wires of the Raystown Company will pass with a clearance of from two (2) to four (4) feet, and in the alley east of Jefferson Street the Penn Central Company has a house service wire over which the Raystown Company's wires will pass with a clearance of two (2) feet.

If the pole of the Raystown Company that is to be erected at the southwest corner of Jefferson Street and the alley were to be used by the Penn Central Company for its house service wires, then it would be possible to secure a clearance of three (3) feet between the wires of the two companies, but the wires of the Raystown Company would then come within seventeen (17) feet from the surface below.

Discussion.

Three (3) feet clearance of low tension wires may be permissible when unavoidable, but it is preferable to have more when the wires belong to different companies. It may be that later the Public Service Commission will work out a standard specification for low tension as well as high tension crossings. Therefore it may be well to consider these proposed crossings in the Borough of Mt. Union in the light of temporary crossings, and especially those at and in the vicinity of Jefferson Street and the alley. At Jefferson Street the Company may be permitted temporarily to carry its line across the street with a vertical clearance of not less than 17 feet between the surface of the street and said wires, and with a vertical clearance between its wires and those of the other company of not less than three (3) feet.

Recommendations.

(1) That the Raystown Water Power Company shall file a satisfactory plan and elevation of each crossing as constructed, showing the lines of the streets and alleys and the poles and the lines of wires of all utility companies at or in the vicinity of each of the said crossings.

(2) There shall be a vertical clearance between the wires of the Raystown Water Power Company and the wires of the Penn Central Light and Power Company, or those of any other company at said crossings, of at least 3 feet, and with the exception of the crossing at Jefferson Street and a small alley, the clearance between the wires of the Raystown Company and the surface of the street shall not be less than 20 feet.

(3) At the proposed crossing of Jefferson Street and the small alley the wires of the Raystown Water Power Company shall have a clearance above the surface of not less than 17 feet, and the said Raystown Water Power Company may, if it so elect, prepare a plan for the joint use by it and the said Penn Central Light and Power Company, whereby the surface wires of the said Penn Central Company shall be attached to the pole of the Raystown Water Power Company, in order to give the necessary clearance specified and upon arrival of this plan, the Public Service Commission may order such joint use of said pole.

(4) The said crossings hereby and herein approved as to form of construction shall be considered temporary as to form, construction and clearance, and if at any time in the opinion of The Public Service Commission it is desired or necessary that said crossings shall be changed in form of construction or clearance, then upon order to make a change therein the Raystown Water Power Company shall forthwith comply with such order of the Public Service Commission.

4—Petersburg.

Porter Township is northwest of Huntingdon Borough and is bounded on the west by the Juniata River. Near Petersburg Borough is the mouth of the Frankstown Branch of the river that comes in from the west and up this branch valley on the Petersburg Cut-off of the Pennsylvania Railroad there is a station called Alferata. Near this station, along the southern bank of the Frankstown Branch of the Juniata River, the Penn Central Light and Power Company has erected its high tension towers and lines. Steel towers have been built, 6-45000 volts high tension wires in two series of three each have been strung, also 3-1100 volt wires and two telephone lines.

Between towers 94 and 95 of said Penn Central Company, where the tramway of the Federal Refractories Company crosses under said Company's line of wires and northerly across the Branch River, which bridge is about 1000 feet west of Alferata Station, it is proposed by the Raystown Water Power Company to erect its poles and transmission lines and pass under and across the right of way and wires and facilities of the said Penn Central Light and Power Company, the said proposed crossing being nearly perpendicular to the line of wires of the Penn Central Company, pole C of the Raystown Company to be attached to a pier of the bridge sustaining the tramway across the river, and pole B to be erected at the other end of the span which is to cross under the said Penn Central line; thence from pole B the line is to deflect nearly perpendicularly and to pass westward paralleling the Penn Central line to pole A, which is to be 125 feet distant from pole B. Hence pole B is to be a pivotal structure and in order to make it rigid, requires a special form of construction.

The Bureau conferred with the representatives of the Raystown Company and of the Penn Central Company, and brought about an agreement with the following recommendations as to the form of construction to be adopted:—

Recommendations.

1. Pole "B" of the Raystown Water Power Company—the pivot pole and the one to sustain the south end of the crossing span proposed, should be built as a double pole and be constructed, in all respects, similar to the standard practice for such poles similarly located, of the Pennsylvania Railroad Company; and this shall apply also in so far as such standard practice is applicable thereto, to poles "C" and "A" and their wiring and appurtenances.

2. The highest wire of the Raystown Water Power Company at the proposed crossing shall be so constructed as to provide a clearance of not less than 8 feet beneath the lowest wire of the Penn Central Company line, this clearance referring to the transmission wires of said companies. The Raystown Water Power Company shall place guard wires at least 5 feet under the wires that are lowest on the Penn Central Light and Power Company's lines, and these guard wires shall be at least 3 feet above the highest wires of the said Raystown Company, at the said proposed crossing, and support and properly ground the said guard wires at either end of the said crossing span, in conformity with standard practice for guard crossings of this kind.

3. If at any time, in the opinion of the Public Service Commission, it is desirable that said crossing shall be changed, altered or improved, the Raystown Water Power Company shall forthwith comply with such order of the Public Service Commission.

4. The Raystown Water Power Company shall, after having constructed the crossing herein and hereby approved, and in the manner herein provided for prepare a satisfactory plan and elevation in detail of the crossing as constructed, and of the rights-of-way, property lines and facilities of the Penn Central Light and Power Company at and in the vicinity of the crossing, together with a description thereof sufficient to enable the Public Service Commission to determine whether the Raystown Water Power Company has built the crossing as ordered.

d—Standardization of Overhead Wire Construction.

There are hundreds of thousands of wire crossings in Pennsylvania. The Public Service Company Law places in the hands of the Public Service Commission the matter of regulating crossings of this kind and the joint use of poles. Evidently the law did not contemplate particular action by the Commission on every crossing constructed. Such attention would be impracticable. It would delay rather than enhance public service and convenience and as evidence of this, reference may be had to Section 12 of Article 5 of the law.

"It shall be proper, however, for the Commission, by general rule or order, whenever the same can be properly regulated by suitable general rule, to prescribe the terms and conditions under which such crossing may be constructed, operated, maintained or protected, without the particular approval of the Commission."

It became evident early in the operations of the Bureau, that the Commission could advisedly proceed under this provision of the law. It has been ascertained by a field investigation and otherwise, that there is a wide variance of opinion held by those interested and concerned in the construction of telephone and telegraph lines, railroad, signal and overhead lines, street railway power and operating

lines and the lines and facilities of electric light and power companies. There is at the present time a large amount of construction that is not in conformity with accepted good practice. The question of responsibility enters as an important element into the conduct of affairs of companies using overhead line construction. If a standard of practice covering these fields of endeavor could be worked out and adopted, it would reduce to a small minimum disputed cases which would have to come before the Commission for its consideration and action. Consequently the Commission decided that the chief of the Bureau of Engineering should look into the problem. With the knowledge and consent of the Commission, the said chief is taking the requisite steps to bring about the appointment of committees of the State associations concerned in wire crossings, for the purpose of meeting in joint convention to discuss the subject, and for the further purpose of working out rules of standard practice to be laid before the Commission for its consideration.

10—ADMINISTRATION OF SERVICE RULES AND REGULATIONS.

Facilities and Organization Projected for the Administration of the Service Rules and Regulations Adopted by the Commission.

Arrangement.

- 1—General Obligations Imposed.
- 2—Facilities and Organizations Required.
- 3—Apparatus Purchased for Use in this Work.
- 4—Meter Prover Tests.
- 5—Plan of Survey of Conditions Existing in the Utilities.
- 6—Report Forms Developed for Use in Survey.
 - (a) Inspection Report, Electric Utilities.
 - (b) Inspection Report, Gas Utilities.
 - (c) Inspection Report, Water Utilities.
 - (d) Inspection Report, Heating Utilities.

General Obligations Imposed.

The adoption by the Commission of the Rules and Regulations discussed in the preceding sections imposed upon the Commission, and hence upon its Engineering Bureau, the obligation to inspect, for approval or otherwise, the standards and the testing facilities used by the utilities in connection with the testing of service meters and the maintenance of the quality of the product. The Rules further impose upon the Bureau the work of calibrating or standardizing certain of these standards, and certifying to their correctness by appropriate certificates or seals,

and further specify January 1st, 1915, as the date after which tests made with uncertified standards will not be considered authoritative. A third obligation imposed by the Rules and Regulations adopted by the Commission has to do with the maintenance by the utilities operating and service records. Although the requirements are less specific than in the case of the other two obligations, it is nevertheless incumbent upon the Bureau to ensure the presence in the records of the Utilities in easily available form, of the information specified by the Rules and Regulations of the Commission.

Facilities and Organization Required.

In order to meet the above obligations, laboratory facilities, a trained laboratory force, a trained field force, and a supervising and directing force are necessary. It was thought wise to proceed cautiously in the equipment of laboratories and the organization of a force, as there was some uncertainty concerning the volume of work to be handled, and concerning the dividing line between field work and laboratory work, particularly in the case of gas and water utilities, and it was felt that by proceeding slowly, the real needs of the situation would soon become apparent. Another very important factor demanding consideration at this time was the smallness of the funds available for equipment and for an organization to carry on the work. In accordance with the above reasoning, it was planned to establish temporary standardizing laboratories in the Engineering Schools of the University of Pennsylvania, Philadelphia, Pa., and the University of Pittsburgh, Pittsburgh, Pa. The facilities available in the laboratories of these schools are such that a very moderate outlay for special equipment would enable the work of the Commission to be carried on satisfactorily until such time as funds were available for the establishment of a laboratory belonging to the Commission. Most of the actual work in connection with these laboratories would be done by experienced members of the teaching staffs, under the supervision of the Consulting Engineers of the Commission, Prof. R. H. Fernald, of the University of Pennsylvania, and Prof. L. H. Harris, of the University of Pittsburgh. The instructors would naturally be paid for their services, but the arrangement would avoid the expense of immediately appointing a full time organization.

It was planned to have the gas meter provers and the gas calorimeters standardized in the field, although this was subsequently modified to the extent of arranging for the calorimeter standardization as laboratory work. It was further decided that the development of the above plans would be aided materially by having available the general information obtained from a survey of conditions existing in the electric, gas, water and heating utilities, with particular reference to items of interest in connection with the Rules and Regulations adopted by the Commission.

Apparatus Purchased.

The following apparatus was purchased for the use of the Bureau in carrying out this work.

(A) 1 1-cubic foot bottle, immersion type, made by the American Meter Company, and certified by the United States Bureau of Standards.

(Used by the Inspector of Meter Provers in testing gas meter provers belonging to, and in use by the utilities.)

(B) 1 Improved Junkers Calorimeter and accessories, made by Junkers & Company, Dassan, Germany, and certified by the United States Bureau of Standards.

(For use in testing the heat value of gas and as a primary standard for the testing of calorimeters belonging to the gas utilities.)

(C) Miscellaneous apparatus for general use in connection with the above equipment and general testing and inspection work.

1—5" Aneroid Barometer.

1—U. S. Weather Bureau Type Sling Psychrometer.

2—Stop watches.

2—Test Thermometers.

1—50 lb. U. S. Standard Test Weight.

1—Special 3' Steel Scale.

Meter Prover Tests.

Mr. A. C. Gumbert, of Pittsburgh, Pa., was appointed Inspector of Meter Provers, and on receipt of the Cubic Foot Bottle spent considerable time in the meter shop of the Equitable Gas Company at Pittsburgh, experimenting with the bottle and its application to prover testing in the field. No further field testing was done, as Mr. Gumbert was taken from this assignment and placed on some investigations connected with the "Full Crew Law."

Plan of Survey.

The chief purpose of the proposed survey was to examine the standards and the testing facilities maintained by the utilities, their use of the same, the nature and adequacy of their records covering the various items specified in the Rules and Regulations of the Commission, and to make recommendations to the Commission concerning the approval of any or all of these items. The inspections necessary to obtain the above information would afford opportunities for placing the Commission and the utilities in closer relation with one another, clarify ideas and concepts for both parties, and offering the representative of the Commission opportunities to be of service to the utilities.

For the purpose of making the survey of conditions existing in the electrical field, the Commission engaged the services, during the summer months, of Prof. L. H. Harris, of the Electrical Engineering School of the University of Pittsburgh, and for making the survey in the field of Gas, Water and Heating Utilities, engaged the services, for a similar period, of Prof. H. E. Ehlers, of the Mechanical Engineering School of the University of Pennsylvania. Prof. Harris had taken an active part in the formation of the Rules and Regulations, and Prof. Ehlers, through his association with Prof. R. H. Fernald, was in close touch with the situation. Professors Harris and Ehlers started their preliminary work of planning the survey, its purpose, its scope, its methods, forms, etc., on June 18th, 1914, and on June 25th, 1914, made their first field inspections in Chester, Pa.

The scope of the electric survey was planned to embrace all companies operating in towns of 10,000 population and over, and an itinerary was mapped out on this basis, using the McGraw Directory as a guide. In view of the better gas records available in the Bureau at the time of planning the survey, it was decided to map out an itinerary covering all gas utilities whose yearly output exceeded 20,000,000 cubic feet, and to inspect as many water and heating utilities as time and circumstances would permit. It was further decided to begin with the artificial gas utilities in the eastern and central portions of the State, covering the water and heating utilities in the towns visited whenever possible.

Report Forms Developed for Use in Survey.

The following forms were developed for use in obtaining and recording the specific information desired. In addition to filling in these form notes, general notes relating to the utility being inspected and to local conditions of interest were submitted, together with specific recommendations covering the approval or otherwise by the Commission of the testing facilities, records and practices of the utility. These detailed reports, covering the six (6) electric, one (1) water, eight (8) gas and one (1) heating utilities inspected prior to July 1st, 1914, are on file in the Bureau of Engineering.

Inspection Report, Electric Service Utilities.

THE PUBLIC SERVICE COMMISSION OF THE COMMONWEALTH OF PENNSYLVANIA.—INSPECTION REPORT ON ELECTRIC SER- VICE UTILITY.—GENERAL INFORMATION.

Date of Inspection:

GENERAL.

Name of Utility.....
 Location of Office.....
 Information furnished by.....
 Nature of service.....
 Extent of territory and population served.....

 Generating stations. (Location, capacity, etc.).....

 What graphic recording meters are connected in each generating station.....

 Are the charts kept?.....
 Are there graphic recording volt meters connected at points distant from the gen-
 erating stations or sub-stations?.....

 What voltage regulating apparatus, automatic or otherwise, is provided at the
 generating stations or sub-stations?.....

 Is a generating log kept?.....How often are readings taken?.....

 Is a record kept of the time of switching on and off all street lighting circuits?

 Is a record kept of interruptions to service?.....

 Is a record kept of all complaints and the action thereon?.....

What is the scope and frequency of inspections?.....
.....
.....
Is any report of inspections made, or record kept?.....
.....

METER TESTING RECORDS.

Number of consumers?.....Number of meters?.....
Is a meter record kept?.....
Does the record show all information called for in Rule XIII?.....
.....
.....
General arrangement of apparatus and methods of testing?.....
.....
.....
Primary standards?
.....

Secondary standards or check meters:

Make	Type	Serial	Volts	Amperes	Frequency
.....
.....
.....

Rotating Standards:

Make	Type	Serial	Volts	Amperes	Frequency
.....
.....
.....
.....
.....
.....
.....
.....

Notes:

*Note:—*In case the records are not kept as specified in Rule X, note the place where these records may be found.

*Inspection Report, Gas Service Utility.*THE PUBLIC SERVICE COMMISSION OF THE COMMONWEALTH OF
PENNSYLVANIA.

INSPECTION REPORT ON GAS SERVICE UTILITY.

GENERAL INFORMATION.

Date of inspection.....

Name of utility:

Location of office:.....

Name and official title of representatives from whom information was obtained:
.....

Nature of service: Artificial Natural Domestic Industrial

Extent of territory served:

.....

Number of meters in service: Positive Proportional Orifice

Location of plant:

Location of testing equipment:

STANDARDS, TESTING FACILITIES AND RECORDS.

Meter Testing Equipment:

Number of provers in use:

Makes, sizes and makers' numbers:

.....

General arrangement:

.....

General condition of apparatus:

.....

Character of testing work:

.....

Meter Test Records:

Do they give the identification of the meter?.....The reason for making the
test?The reading of the meter before being disturbed?.....The
accuracy of the meter?.....All data taken at test?.....Do they permit
the checking of the result?.....Nature of record?.....Where filed?.....

Meter History Records:

Numerically arranged?.....Do they give date of purchase?.....Name of
manufacturer?Size?Identification?Various places of in-
stallation?Dates of installation and removal?Dates and gen-
eral results of tests?..... Nature of records?.....

Allowable error on meters, if less than the requirements?.....

Periodical tests of meters, if more frequent than the requirements?

Installation of Meters:

Who inspects the installation of a meter?.....Is a record kept of
the inspection?.....Of the time of previous test of meter?.....

Meters in Service Without Test Record:

Is positive provision being made for testing them within the periods specified by the requirements?.....How?

Request Tests and Records:

General method of handling request tests?.....

Is meter sealed before removal?.....Is a report of test issued to consumer?.....Is a report of test kept on file?.....Where?.....

Calorimeter Equipment:

Calorimeter—make?Maker's Number?.....
 Meter—make?Maker's Number?.....
 Thermometers—graduations?Calibrated?.....
 Water measurement—graduate?.....Scales?.....Range?
 Least Count?

General arrangement of apparatus?.....

General condition of apparatus?.....

Where is calorimeter set up?.....
 Distance of point of sampling from station governor?.....
 Frequency of tests?.....Nature of test records?.....
 Do they give all data?Where filed?.....
 Monthly average B. T. U.?.....
 Character of testing work?.....

Pressure Measurements:

Recording gauges in service: H. P. distribution system?.....L. P. System?.....
 Distribution of gauges on systems?.....
 Nature of records and where filed?.....
 Periodic surveys: Number and approximate locations of gauges used?.....
 Frequency of surveys?.....Nature of record and where filed?.....

Approximate distribution pressures: Minimum?.....Maximum?.....Average?.....

Sulphur Content:

Method of test?Frequency of test?.....
 Where tested?Nature of record?.....

Service Interruption Record:

Does it give time of interruptions?.....Cause?Extent?.....
 Duration?

General nature of record?.....On file at?.....

Complaint Records:

Does record give name and address of complainant?.....Date and nature of
complaint?.....Action taken?Date of final
disposition?General nature of record?
On file at?.....

Inspection of Equipment:

How often made??.....Are records kept on file and where?.....

Accidents:

Where are records of accidents kept on file?.....

RECOMMENDATIONS CONCERNING APPROVAL:

Mr. F. Herbert Snow,
Chief, Bureau of Engineering.

Dear Sir:

As a result of the inspection reported above, the following recommendations are
made:

.....
.....
.....
.....

Report forwarded—.....

Date.....

Inspector.

Inspection Report, Water Service Utility.

THE PUBLIC SERVICE COMMISSION OF THE COMMONWEALTH OF
PENNSYLVANIA.

INSPECTION REPORT OF WATER SERVICE UTILITY.

GENERAL INFORMATION.

Date of Inspection.....

Name of utility

Name and official title of representatives from whom information was obtained
.....

Nature of service.....Number of meters in service.....

Extent of territory served:

Location of plant

Location of testing equipment.....

STANDARDS AND TESTING FACILITIES.

Water Meter Testing Equipment:

General nature and arrangement of equipment.....

 General condition of apparatus

 Character of testing work

 Remarks

RECORDS.

Meter Test Records:

Do they give the identification of the meter?.....The reason for making the
 test?.....The reading of the meter before being disturbed?.....
 The accuracy of the meter?.....All data taken at test?.....Do they
 permit the checking of the results?.....Nature of record?.....
 Where filed?

Meter History Records:

Numerically arranged?.....Do they give date of purchase?.....
 Name of manufacturer?.....Size?.....Identification?.....
 Various places of installation?.....Dates of installation and removal?
Dates and general results of tests?..... Nature of
 record?

Allowable error on meters, if less than the requirements?.....

Periodic tests on meters, if more frequent than the requirements?.....

Installation of Meters:

Who inspects the installation of a meter?.....Is a record kept of the
 inspection?.....Of the time of previous test of meter?.....

Meters in Service Without Test Record:

Is positive provision being made for testing them within the periods specified
 by the requirements?.....How?.....

Request Tests and Records:

General method of handling request tests?.....

Is meter sealed before removal?.....Is a report of test issued to con-
 sumer?.....Is a report of test kept on file?..... Where?.....

Service Interruption Records:

Does it give time of interruption?.....Cause?..... ..Extent?.....
 Duration?

General nature of record?.....On file at.... ..

Complaint Records:

Does record give name and address of complainant?.....Date and nature
 of complaint?.....Action taken?.....Date of final
 disposition?.....General nature of record?.....

Inspection of Equipment:

How often made?.....Are records kept on file?.....
 And where?

Accidents:

Where are records of accidents kept on file?.....

RECOMMENDATIONS CONCERNING APPROVAL.

Mr. F. Herbert Snow,
 Chief, Bureau of Engineering,

Dear Sir:—

As a result of the inspection reported above, the following recommendations
 are made:

.....

Report forwarded:

Date..... Inspector.

Inspection Report, Heating Service Utility.

THE PUBLIC SERVICE COMMISSION OF THE COMMONWEALTH OF
 PENNSYLVANIA.

INSPECTION REPORT OF HEATING SERVICE UTILITY.

GENERAL INFORMATION.

Date of Inspection.....

Name of utility

Location of Office

Name and official title of representatives from whom information was obtained

Nature of service.....Number of meters in service.....
 Extent of territory served:

 Location of plant
 Location of testing equipment.....

STANDARDS AND TESTING FACILITIES.

Hot Water or Condensation Meter Testing Equipment:

General nature and arrangement of equipment.....

 General condition of apparatus.....

 Remarks

RECORDS.

Meter Test Records:

Do they give the identification of the meter?.....The reason for making the
 test?.....The reading of the meter before being disturbed?.....
 The accuracy of the meter?.....All data taken at test?.....Do they
 permit the checking of the results?.....Nature of record?.....
 Where filed?.....

Meter History Records:

Numerically arranged?.....Do they give date of purchase?.....
 Name of manufacturer?.....Size?.....Various places of in-
 stallation?.....Dates of installation and removal?.....Dates
 and general results of tests?.....Nature of record?.....

Allowable error on meters, if less than the requirements?.....
 Periodic tests of meters, if more frequent than the requirements?.....

Installation of Meters:

Who inspects the installation of a meter?.....Is a record kept of the
 inspection?.....Of the time of previous test of meter?.....

Meters in Service Without Test Record:

Is positive provision being made for testing them within the periods specified by
 the requirements?.....How?.....

Request Tests and Records:

General method of handling request tests?.....

Is meter sealed before removal?.....Is a report of test issued to con-
 sumer?.....Is a report of test kept on file?.....Where?.....

Service Interruption Record:

Does it give time of interruptions?.....Cause?.....Extent?.....
 Duration?

General Nature of Record?.....On file at?.....

Complaint Records:

Does record give name and address of complainant?.....Date and nature
 of complaint?.....Action taken?.....Date of final disposi-
 tion?.....General nature of record?.....
 On file at?

Inspection of Equipment:

How often made?.....Are records kept on file?.....
 And where?.....

Accidents:

Where are records of accidents kept on file?.....

RECOMMENDATIONS CONCERNING APPROVAL.

Mr. F. Herbert Snow,
 Chief, Bureau of Engineering,

Dear Sir:—

As a result of the inspection reported above, the following recommendations
 are made:

.....

Report forwarded:

Date.....

Inspector.

PART THREE

RULES AND REGULATIONS PERTAINING TO ELECTRIC, GAS, HEATING AND WATER SERVICE UTILITIES.

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PART THREE

RULES AND REGULATIONS PERTAINING TO ELECTRIC, GAS, HEATING AND WATER SERVICE UTILITIES.

1—EXPLANATORY.

The work of preparing the Rules and Regulations adopted on April 9, 1914, by The Public Service Commission of the Commonwealth of Pennsylvania, pertaining to electric, gas, heating and water service utilities was performed previous to the establishment of the Bureau of Engineering.

Prof. R. H. Fernald, University of Pennsylvania, and Prof. L. H. Harris, of the University of Pittsburgh, were engaged to study this problem and to frame rules and regulations under the supervision of Commissioner Tone. During the progress of the work, hearings were given to which representatives of the utilities were invited to be present.

The Rules and Regulations as adopted were divided into two parts. The first part deals with those general features of operation which go to make up "service." The second part deals with meters and meter testing.

The purpose of the first part of these Rules and Regulations was to place before the operators information as to what would ordinarily be considered good practice, or in terms of the act "reasonably adequate" service. The purpose of the second part of these Rules and Regulations was more specific, and in this part is made an effort to define the requirements in such terms that they may be quite readily followed by all operating Public Service Companies affected.

Every consumer who buys service by meter is affected by these rules. The practice of the operating company in this regard is, therefore, of importance to every consumer, and should in every case be satisfactory to the Commission, and under the rules as adopted must be satisfactory to and be approved by the Commission.

In the said preparation of the rules for the regulation of the four public utilities mentioned, the guiding principle was that of fair treatment for both the public served by the utility and the utility itself. It was realized that the stringent regulations that might be consistently met by certain large companies in the larger cities might prove absolutely prohibitive when imposed upon the smaller communities of the State with their limited backing. So it was felt, in order to be fair, that on the one hand, the rules should impose high standards of quality of the commodity furnished, and of service rendered, and on the other hand, they should impose no undue hardships upon the smaller utilities.

Any rules or regulations that place excessive demands upon a utility result in increased expense, and any increase in the cost of manufacture or distribution must ultimately be borne by the public. It is, however, but consistent that the prices charged shall warrant adequate and satisfactory service, and shall allow a fair return on the invested capital. An increase in price with no apparent betterment of service or of the quality of the commodity delivered, makes trouble.

It was also regarded important that although the requirements be rigid, they should not be so rigid as to prohibit the possibility of their enforcement.

From utilities furnishing electric, gas, heat or water service, the public has the right to expect—

- 1—A commodity of good and reasonably uniform quality.
- 2—Satisfactory and reasonable uniform pressure.
- 3—Correct appliances for measuring the amount of the commodity used by each customer.
- 4—Freedom from interruptions to service and avoidance of accidents.
- 5—Reasonable prices for the service rendered.
- 6—Proper distribution and readiness to serve all communities within the natural territory supplied by the utility.

2—ELECTRIC UTILITIES.
Circular No. 10—A.

RULES AND REGULATIONS
Adopted April 9, 1914.

THE PUBLIC SERVICE COMMISSION
of the
COMMONWEALTH OF PENNSYLVANIA.

Part I.

GENERAL.

Definition:

The term "utility" as used in these rules includes all public service companies, corporations and persons, as defined in The Service Company Law, engaged in the production, sale or distribution of electricity within the jurisdiction of the Commission.

I.—Statutory:

"It shall be the duty of every public service company to furnish and maintain such service, including facilities, as shall in all respects be just, reasonably adequate, and practically sufficient for the accommodation and safety of its patrons, employees, and the public, and in conformity with such reasonable regulations or orders as may be made by the Commission."

II.—Voltage Variation:

Each utility supplying electrical energy from a constant voltage system, shall adopt standard service voltage for such system, the suitability and adequacy of which voltages may be determined at any time by the Commission, and every reasonable effort shall be made to maintain such voltage practically constant at all times during which service is supplied. For service rendered under a lighting contract, or primarily for lighting purposes, the variations of voltage as measured at the service terminals shall not exceed five (5%) per cent., plus or minus, of the standard service voltage for that locality, for a longer period than one minute at each instance, at any time during which service is supplied. For service rendered under a power contract, or primarily for power purposes, voltage variations as measured at the service terminals shall not exceed ten (10%) per cent., plus or minus, of the standard service voltage for that locality for a longer period than one minute at each instance: Provided, First, That this limit of ten (10%) per cent., shall not apply to power supplied from direct current trolley wires; and, Second, That a utility may, if satisfactory and approved by the Commission, furnish service under conditions of greater voltage variations, (a) upon filing with the

Commission a copy of all existing contracts containing a provision for service with such greater variation of voltage, or (b) upon filing with the Commission a copy of all existing contracts which do not contain a provision for such greater variations in voltage, together with a statement in each case of the variation in voltage existing in the service rendered under each said contract, and (c) upon filing with the Commission a copy of all contracts made hereafter which contemplate service under conditions of greater voltage variations, and which shall in each case henceforth contain a clause stating the probable variations in voltage that will occur in the service rendered under said contract: And, Provided further, that such greater variation in the voltage shall not result in unreasonable discrimination in favor of or against any consumer. Variations of voltage in excess of those specified above, caused by the operations of the consumer in violation of his contract or the rules of the utility, or from causes beyond the control of the utility, shall not be considered a violation of this rule.

III.—*Record of Station Voltage:*

Each utility shall keep in continuous operation at least one graphic recording voltmeter in each generating station. Each utility shall also place and connect additional graphic recording voltmeters at such places and for such periods of time as the Commission may from time to time require. All records from such meters shall be kept on file as specified in Rule X.

IV.—*Standard Frequency:*

Each utility supplying alternating current shall adopt a standard frequency, the suitability of which may be determined by the Commission, and shall maintain this frequency within five (5%) per cent., plus or minus, of standard, at all times during which service is supplied: Provided, That momentary variations of frequency of more than five (5%) per cent., which are clearly due to no lack of proper equipment or reasonable care on the part of the utility, shall not be considered a violation of this rule.

V.—*Records of Load and Interruptions:*

Each utility shall keep a record of the time of starting and disconnecting all street lighting circuits; of the readings of such instruments at each generating station, and at such intervals as are necessary to determine the characteristics of the load; and of all interruptions to service affecting the busbars, feeders, or distributing mains, which record shall show the time, duration, extent, and the cause when known, of the interruption. An interruption is here defined for the purpose of record only, as the interval of time during which the voltage falls below fifty (50%) per cent. of standard voltage. All such records shall be kept as specified in Rule X, for at least two years.

VI.—*Complaint Records:*

Each utility shall keep a record of all written complaints received from its consumers in regard to service, which record shall show the name and address of the complainant, the date and nature of the complaint, the action taken, and the date of final disposition of the matter. These records shall be kept as specified in Rule X

VII.—*Maintenance and Inspection:*

Each utility shall maintain its equipment and facilities and shall make periodic inspection of the same, all in accordance with good practice, and in a manner satisfactory to the Commission. Each utility shall also keep a complete record of all such inspections, as specified in Rule X, and shall file with the Commission a statement of the condition of its equipment and facilities, and such copies of its report of inspections as the Commission may require.

VIII.—*Defective Apparatus:*

Whenever any equipment or facilities, the failure of which would involve life hazard, are removed from service for any reason, they must be thoroughly inspected and tested before being again placed in service, and no equipment or facilities shall be placed in service or continued in service, which have for any reason become dangerous, or liable to cause injury to persons or damage to property.

IX.—*Accidents:*

Each utility shall keep a record of and shall furnish to the Investigator of Accidents for the Commission, in accordance with the rules of the Commission, reports of any and all accidents happening in or about or in connection with the operation of its property, facilities or service, wherein any person shall have been killed or injured, or property damaged or destroyed, with a full statement as far as possible of the causes of such accidents, and the precautions, if any, taken as prevention against future accidents of similar character.

X.—*Records and Reports:*

All records required by these Rules shall be kept within the State, at an office or offices of the utility located in the territory served by it, and shall be open for examination by the Commission or its representative. Each utility shall notify the Commission of the office or offices at which the various classes of records are kept, and shall file with the Commission such reports as the Commission may from time to time require.

Part II.

METERS.

XI.—*Allowable Error:*

No watt-hour meter shall be placed in service nor allowed to remain in service, which registers at no load when the applied voltage is less than one hundred and ten (110%) per cent. of standard service voltage, nor which is in any way mechanically defective, nor which has incorrect constants, nor an error in measurement in excess of four (4%) per cent.

XII.—*Method of Determining the Error:*

The error of a service watt-hour meter shall be determined as follows: The error at light load; here defined as not less than five (5%) per cent. nor more than ten (10%) per cent. of rated capacity for induction type meters, and not less than ten (10%) per cent. nor more than fifteen (15%) per cent. of rated capacity for

commutator type and mercury type meters—shall be determined by taking the average of at least two errors, determining from as many separate readings of the same light load, which errors must agree with each other within one-half (.5%) per cent. of registration accuracy. In the same manner the error at heavy load—here defined as not less than seventy-five (75%) per cent. nor more than one hundred (100%) per cent. of rated capacity—shall be determined.

The error of the meter shall then be determined by taking the average of the error at light load and the error at heavy load, proper account being taken of the sign of these two errors: Provided, That where the consumer's connected load does not equal seventy-five (75%) per cent. of the rated capacity of the meter, the full connected load may be considered as heavy load for purposes of test.

In all cases where it is not practicable to determine the error by the method outlined above, the utility shall have the option of installing an approved check meter or meters, and determining the error of the service meter by comparing the watt-hours registered by the check meter with the watt-hour registered by the service meter in the same time. When this option is exercised, the check meter shall be left in circuit until the hand on the first dial of the service meter shall have made at least two complete revolutions. If a utility desires to use "per cent. registration" or "accuracy," in place of "per cent. error," the percent. registration shall be determined in the same manner as provided above for determining per cent. error.

XIII.—*Meter Record:*

Each utility shall maintain a record of all its service watt-hour meters, which record shall show the name of the manufacturer, the type, the rating, the date of purchase when purchased after July 1st, 1914, the date and location of all installations in service and the removals therefrom, the date of all tests and the reasons therefor, and the error "as found" and "as left." This report shall be kept as specified in Rule X, and shall be complete and up to date within three years subsequent to July 1st, 1914.

XIV.—*Test Previous to Installation:*

Each watt-hour meter installed after July 1st, 1914, shall have been tested for accuracy by the utility within ninety (90) days previous to its installation, or shall be so tested within sixty (60) days thereafter. It shall also be inspected by the utility for proper connection, mechanical condition, and suitability of location within sixty (60) days after the installation.

XV.—*Facilities for Testing:*

Each utility shall provide for and have available, suitable and adequate facilities for testing its watt-hour meters, in each case to be satisfactory to an approval by the Commission. These facilities shall, in general, include a test bench free from unnecessary encumbrances, one or more portable rotating standard watt-hour meters, a suitable check meter or meters mounted on the test bench, and such other necessary equipment as the Commission may require. The check meter shall be the standard for the utility, and shall be periodically tested for accuracy, and adjusted when necessary by a representative of the Commission, and at such place as the Commission may direct. Immediately after making final adjustment, the tester shall seal and date tag the meter, and shall furnish the utility with a correction curve properly dated and signed.

The portable rotating standard shall also be tested and adjusted periodically by a representative of the Commission, and at such place as the Commission may direct. The tester shall furnish the utility with a correction curve properly dated and signed. During the interval between tests by the Commission, the portable standard shall be compared with the check meter at least once each week for commutating types, and at least once every two weeks for induction types, during the time the portable meter is in service, and the calibration thus obtained shall be used in determining the error of the service meters. A complete record of these check-meters shall be kept for at least two years, as specified in Rule X. This record shall show the condition and accuracy of the rotating standard "as found" and "as left;" all in such form and such detail as to permit of convenient checking of the method and results.

All correction curves furnished by the Commission shall be kept with the meter until superseded. After January 1, 1915, tests made with uncertified facilities will not be deemed authoritative.

XVI.—*Frequency of Periodic Tests:*

Each utility shall make periodic tests of all its watt-hour meters in service, in accordance with the following schedule:

- (a) Two and three wire commutating type and mercury type meters, up to and including fifty (50) amperes rated capacity of meter element, shall be tested at least once every eighteen (18) months.
- (b) Two and three wire commutating type and mercury type meters of over fifty (50) amperes rated capacity of meter element, shall be tested at least once every twelve (12) months.
- (c) Two and three wire single phase induction type meters, up to and including twenty-five (25) amperes rated capacity of meter element, and manufactured prior to January 1st, 1907, shall be tested at least once every thirty (30) months. Meters of the same type and rating manufactured since January 1st, 1907, shall be tested at least once every thirty-six (36) months.
- (d) Two and three wire single phase induction type meters of over twenty-five amperes rated capacity of meter element, shall be tested at least once every twenty-four (24) months.
- (e) Self contained polyphase meters up to and including fifty (50) k. w. rated capacity, shall be tested at least once every eighteen (18) months.
- (f) Self contained polyphase meters of over fifty (50) k. w. rated capacity, shall be tested at least once every twelve (12) months.
- (g) Polyphase meters connected through current transformers or current and potential transformers, to circuits up to and including fifty (50) k. w. rated capacity, shall be tested at least once every twenty-four (24) months.
- (h) Polyphase meters connected through current transformers, or current and potential transformers, to circuits of over fifty (50) k. w. capacity, shall be tested at least once every eighteen (18) months.

Whenever the number of meters of any type which register in error beyond the limits specified in Rule XI, is deemed by the Commission to be excessive, then this type shall be tested with such additional frequency as the Commission may direct.

XVII.—*Meters in Service Without Test Records:*

All watt-hour meters in service on and after July 1, 1914, for which there is no record of test within the time equal to the period of test for that class and rating of meter as specified in Rule XVI, shall be tested as soon thereafter as circumstances will permit. In no case shall the time subsequent to July 1, 1914, exceed the length of time of the period of test for meters of that class and rating as specified in Rule XVI.

XVIII.—*Request Tests:*

Each utility shall upon the written request of a consumer, and if he so desires, in his presence or that of his authorized representative, make a test of the accuracy of his meter. When a consumer desires, either personally or by a representative, to witness the testing of a meter, he may require the seal of the meter to be broken only in his presence or that of his representative. If the meter so tested shall be found to be accurate within the limits specified in Rule XI, a fee determined from the schedule indicated below, shall be paid to the utility by the consumer requiring such test; but if not so found, then the cost thereof shall be borne by the utility furnishing the service. When making such request, the consumer shall agree to the basis of payment herein specified. A report of such test shall be made to the consumer, and a complete record of such test shall be kept on file as specified in Rule X.

SCHEDULE OF FEES FOR TESTING WATT-HOUR METERS.

(a) For direct current and single phase meters operating on 600 volts or less, up to and including twenty-five (25) amperes rated capacity of the meter element,.....	\$1 50
(b) For each additional fifty (50) amperes or fraction thereof,.....	50
(c) For single phase meters above 600 volts, and for polyphase meters with or without instrument transformers, up to and including twenty-five k. w. rated capacity of the circuit,.....	2 50
(d) For each additional twenty-five (25) k. w. rated capacity, or fraction thereof,	2 50

Rates for meters not included in the above classification, or so located that the cost is out of proportion to the fee specified, will be furnished by the Commission upon receipt of complete specifications.

XIX.—*Power Factor Adjustment:*

All alternating current watt-hour meters which are provided with a power factor compensation, should be tested and adjusted for correct registration within two (2%) per cent. plus or minus, at one hundred (100%) per cent. power factor, and within four (4%) per cent. at zero or fifty (50%) per cent. power factor (lagging) before installation. All alternating current watt-hour meters in service which have not been so tested and adjusted before installation, and which are connected to circuits supplying other than non-inductive load, shall be tested for accuracy at one hundred (100%) per cent. power factor, and at zero or fifty (50%) per cent. lagging power factor. In all cases where it is not practicable to determine the error of the meter at these power factors, the utility shall have the option of installing an approved check meter, and determining the error as provided in the last paragraph of Rule XII.

XX.—*Place of Making Tests:*

All tests provided for in Rules XIV, XVI and XVIII, and except those made previous to installation as provided for in Rule XIV, shall be made in the place of permanent location on the consumer's premises, with approved equipment and under local conditions.

XXI.—*Watt-Hour Meter Tests Without Accessories:*

In all cases where a service watt-hour meter is connected to the line through shunts, multipliers, or instrument transformers, the test may be made on the meter as a self contained unit, and the ratio of the accessories used to determine the error of the meter, provided that the certificates of the accessories bear a date within five years, and are satisfactory to the Commission.

XXII.—*Adjustment After Test:*

All service watt-hour meters shall be so adjusted after test that the error of the meter as defined in Rule XII shall not exceed two (2%) per cent. Neither shall the error at light load exceed four (4%) per cent., nor the error at heavy load exceed two (2%) per cent.

XXIII.—*Change of Frequency:*

If a utility shall change its standard of frequency, it shall give reasonable notice to all its consumers, and shall make tests and shall readjust all watt-hour meters as soon thereafter as practicable, and shall refund to the consumer all the excess charges which have been collected from him by reason of the change of frequency.

XXIV.—*Refund for Overcharge:*

If a meter be found to be fast by more than four (4%) per cent. as defined in Rule XII at any test, an allowance or refund shall be made to the consumer by the utility, equal to all the excess charged the consumer, figured back from the date of test through the entire period of the current bill, unless it can be shown that the error is due to an accident or other cause, the exact time of which is known, in which case it shall be figured back to such time.

3—COMMENTS ON THE RULES FOR REGULATING ELECTRIC UTILITIES.

The following comments were made by Prof. Harris, who prepared the Rules for Electric Utilities under the supervision of Commissioner Tone, and in co-operation with Prof. Fernald.

Rule I—*Statutory:* In a number of points, the rules are general in character and one who looks to them for specific instructions in all things will be disappointed. Many companies have well established practices, covered by these Rules, which differ for different companies, yet accomplish essentially the same results. So it

would seem unnecessary to set up an arbitrary procedure in all cases which might have "uniformity" as its sole claim for merit, however desirable uniformity might be. Taking the Rules as a whole, they should be looked upon as a sort of sign post, pointing the way to desired results, but not attempting to specify the exact manner of arriving at these results. The results themselves are necessary and desirable, and they can be accomplished with comparatively little disturbance and friction, if observed in the proper spirit.

Rule II—Voltage Variations. The purposes of this rule are two-fold, viz:

(a) To provide a reference voltage which can be used to determine the suitability of any lighting units used thereon, and on which to base any necessary calculations of voltage variations arising from subsequent complaints;

(b) To indicate the outside limits of such variations of voltage which would ordinarily be permissible.

The expression "constant voltage system" is used to distinguish the ordinary commercial circuit from the constant current circuit. It does not mean that it must be of the same voltage throughout, or that all consumers must be supplied current at the same voltage.

The clause "shall adopt standard service voltages for such systems" means simply that in the case of any question arising as to the suitability of lighting units or of the constancy of voltage supplied the consumer, the utility shall decide and state what they consider the "standard service voltage" for the place in question.

Rule III. Record of Station Voltage: The purpose of requiring a record of station voltage can be stated as follows:

(a) To stimulate the station attendants to greater attention to this feature of service;

(b) To provide a record which, while it does not necessarily show the condition at any particular point out on the line, does furnish a good indication as to whether the trouble lies within the generating station, or with the distributing system;

(c) It serves as a record of the continuity of operation of the station. A graphic recording watt-meter would accomplish this latter purpose, but could not meet the other two and, desirable as it is itself, should not be considered a substitute for the graphic recording voltmeter. In this connection I should like to point out that the total absence of graphic meters in many stations, and even of station watt-hour meters in some, would indicate a lack of exact knowledge on the part of many managers as well as a lack of appreciation of the value of such knowledge.

The practice of making voltage surveys is not as common as it should be. Such work is commonly done only on complaint, and then many times with indicating instruments. This must be unsatisfactory to the complainant and is more work for the company, and certainly less satisfactory than such inspections made with a graphic meter. Such complaints can be practically eliminated by the use of portable graphic meters, and their more frequent use is urged.

Rule V—Records of load and interruptions: These records are required primarily for the reason that they are considered essential to the intelligent operation of a station, and for the further reason that they have an important bearing on the question of the adequacy of the facilities or equipment to meet the demands made upon them.

In the absence of any graphic recording meters, it would seem advisable to take, at least, hourly readings of the feeder ammeters and watt-meters, or feeder ammeters and power factor meters, with perhaps half hour readings during the peaks.

The records of interruption should be, and usually are, kept on the station log sheet.

Rule VI—*Complaint Records.* It is recognized that practically all so-called "complaints" are not of the fault-finding variety, but merely notifications, and are usually delivered verbally or over the telephone.

All written communications from consumer to utility regarding the quality of service, whether justified or not, are complaints under this Rule and must be kept on file, together with a memorandum of the action taken in regard thereto, as called for in the Rule.

Rule VII—*Maintenance and Inspection.* Inspection is the foundation of maintenance. "Good practice" in the matter of inspections may well differ in character as well as frequency, depending upon the importance of the system itself to the community. It is reasonable to presume that the utility is more interested in maintaining uninterrupted service and preventing expensive accidents than is anyone else, and can be trusted to do what seems sufficient in this regard. Nevertheless a thorough inspection of the physical condition of the entire plant is rarely ever made, and then almost invariably by men so used to the existing condition that it is doubtful if a critical inspection is actually made. I submit for your consideration that the entire property from boiler room to distributing transformers should, in addition to the constant inspection maintained by meter readers, are lamp trimmers, line men, and others, be rigidly inspected by competent men, at least once a year, and that the condition of the property as adjudged by these inspectors should be a matter of record, such for example, as a report from the proper superintendents to the general manager, or from the general manager to the directors. Every inspector should at least report if only to say that "all is well."

Rule VIII—*Defective Apparatus.* No detail requirements can be given on this subject. Transformers in particular should be given a voltage test before installation, whether the installation be temporary or permanent.

Rule X—*Records and Reports.* This was so worded in order to eliminate the possibility of having to go outside of the Commonwealth to secure the information. It does not discourage the concentration of reports in one office, but rather encourages it. This practice of bringing all records together at one office is common in all large companies operating either in metropolitan districts or in a chain of neighboring cities and towns.

Part II.

METERS.

Rule XI—*Allowable Error.* Four per cent. is considered the outside permissible error, (96% to 104% registration). Since meters are required to be adjusted to correct registration within two per cent. (98% to 102% registration (see **Rule XXII**) and are customarily adjusted to correct registration within 1% after tests, this leaves a margin of from 2% to 3% or more before the utility can be penalized.

Rule XII—*Method of Determining the Error.* In several states nine separate readings are required to determine the accuracy or error of a meter; three at light load, three at half (or average) load, and three at full load; these nine readings being weighted or not before averaging, depending upon the particular rules. Only four readings are here required; two at light load and two at heavy load. This may seem to leave out of consideration that percentage of the load where, in all probability, the meter registers most of the energy passed through it, yet when it is considered that the meter must not creep on less than 10% over voltage; that it must register between 98% and 102% on light load, and that it must likewise register between 98% and 102% at heavy or full load, it does not seem that either the consumer or the utility is likely to suffer any hardship from this test at two points only. There can be no objection to testing a meter at any load between these two points, but such tests are considered unnecessary and should not be used in determining the "error of the meter."

All tests of consumer's meters should preferably be done with rotating standards. Where it is impracticable to do so, the indicating instruments should be submitted to the Commission for calibration beforehand and reserved for this purpose while such tests are being made.

Rule XIII—*Meter Records.* The practices of even the larger companies differ in this respect. Because of the established practices in vogue among many companies, involving tens of thousands of meters, which, while differing from each other, yet furnish all the necessary information, it was not considered advisable to specify uniform methods of keeping these records. For the benefit of the smaller companies which still have these records to prepare, I would suggest that the State Association could do the industry a service by considering the question of a uniform system which it could recommend to all companies not already committed to a definite program.

The simplest satisfactory form of records met with so far employs three sets of forms, viz:

(a) A meter life card which shows all the characteristics of the meter, the record of installations and removals, and the date and results of all tests; in short, showing all the information concerning a particular meter asked for in Rule XIII. These are filed numerically by serial number.

(b) A consumer's card showing the serial of the meter installed and such additional data as the utility may desire, filed alphabetically.

(c) A test slip for the use of the meter tester, showing the serial of the meter, the location, the date and results of tests. The results of the test are transferred to the "life card" and a new test slip made for the next periodic test and filed under the calendar month when such test is due.

Rule XV—*Facilities for Testing.* No attempt has been made to say here what shall be adequate for all cases. The circumstance in each case must decide. The minimum equipment which would likely suffice, would be a rotating standard and a secondary standard or check meter. The purpose of the check meter is, of course, to detect any unusual or sudden change in the accuracy of the rotating standard which might occur. For the smaller companies, where the cost of maintaining expensive secondary standards would prove a burden, suitable service type meters might be used. For this purpose only the best and most reliable service meter would be accepted.

The Commission is required to certify to the accuracy of all facilities used in testing the consumers' meters, and to this end it will designate certain standardizing laboratories in the State to which all standards may be sent for calibration. Directions will be issued later on this point.

Rule XVI—Frequency of Periodic Tests. Experience is the only guide for determining the proper period of tests. Such data as is available seems to indicate that from two to three years is a safe interval for small meters, and correspondingly shorter intervals for meters of larger capacity. The fact that meters under ordinary circumstances of wear, will tend to run slow, provides an incentive for more frequent tests on meters involving large revenue.

It is proper to suggest here that many of the smaller companies, not already equipped with meter testing facilities, might profitably employ at intervals, a competent tester with the necessary apparatus, who could make all the periodic tests required for the year in a short time. If such an arrangement was desirable, the consent of the Commission should be obtained beforehand.

Rule XIX—Power Factor Adjustments. This rule is concerned only with those meters which are connected to low power factor loads. Ordinary household loads do not come in this class. It places the responsibility for the correct registration at these low power factors squarely upon the utility furnishing the meter.

Rule XX—Place of Making Tests. The clause "under local conditions" means that the meter must not be disturbed from its mounting, nor must any external conditions, such as vibrations, stray fields, etc., be altered for the test. It does not mean that a meter must be tested on passing load, but may be tested by special loading devices if more convenient.

Rule XXI—Watt-Hour Meter Tests Without Accessories. The only phase of this rule which seems to have raised any question concerns the testing of current transformers. There are two cases to consider:

(a) Current transformers which are already in service, for which there is no ratio curve, and (b) current transformers purchased hereafter.

The two largest manufacturers will guarantee that the ratio of any particular transformers will not differ more than 1% at light load nor more than one-half per cent. at full load from the average ratio for that type and rating of transformer. The Commission will accept the manufacturer's ratio for that type and rating of transformer in lieu of a specially made curve for the individual transformer in question. This eliminates any additional expense on future purchases. As for those in service, the simplest method of test would seem to be to compare it with another similar transformer whose ratio is known. This could be done, in some cases without removing the transformers from service by connecting a new one in service with it, together with a suitable meter and comparing the registration, or if not conveniently tested in service, it could be removed to the laboratory and there compared.

The meters themselves, of course, would be tested and adjusted beforehand, so that their registration would be a correct indication of the relative ratio of the transformers.

SUMMARY OF COMMENTS.

Summing up then, there are these points regarding meters, which each utility is expected to observe:

- 1—Each meter must be tested before installation or shortly thereafter. (See Rule XIV.)
- 2—If the meter is connected to low power factor loads, the utility shall see to it that the meter is correct on low power factor. (See Rule XIX.)
- 3—Each meter is to be tested periodically. (See Rule XVI.)
- 4—These periodic tests are to be made at the consumer's premises. (See Rule XX.)
- 5—Each meter shall be adjusted after test to correct registration within two per cent. plus or minus. (See Rule XXII.)

There are three questions of policy to be noted. One of them is that the Commission does not undertake to specify in these Rules, what make or type of apparatus shall be used by the utilities, providing only that the equipment used shall meet such reasonable requirements as to accuracy and dependability as the work demands. Another is that the Commission tests only the standards of the utilities and not the consumers' meters. The third is that no periodic reports of any kind are required by these Rules. Reports will doubtless be asked for later, when the information can serve some useful purpose.

4—GAS SERVICE UTILITIES.

Circular No. 9-A.

RULES AND REGULATIONS

Adopted April 9, 1914.

THE PUBLIC SERVICE COMMISSION
of the
COMMONWEALTH OF PENNSYLVANIA.

Part I.

GENERAL.

Definition:

The term "utility" in these rules includes all public service companies, corporations and persons, as defined in "The Public Service Company Law," engaged in the production, sale or distribution of gas within the jurisdiction of the Commission.

I.—*Statutory:*

“It shall be the duty of every public service company to furnish and maintain such service, including facilities, as shall in all respects be just, reasonably adequate, and practically sufficient for the accommodation and safety of its patrons, employes, and the public, and in conformity with such reasonable regulations or orders as may be made by the Commission.”

II.—*Pressure Variation:*

Each utility furnishing manufactured gas shall maintain at the consumer's meter outlet a gas pressure of not less than one-and-one-half inches nor more than eight inches of water pressure; and within said limits the daily variation of pressure at the outlet of any one meter on the system shall never be greater than one hundred (100%) per cent. of the minimum pressure. Each utility furnishing natural gas shall maintain at the consumer's meter outlet a gas pressure of not less than one and one-half inches, nor more than fourteen inches of water pressure, except when greater pressure is specifically provided in the contract between the utility and the consumer, provided there shall be no unfair and unreasonable discrimination or preference; and within the said limits the daily variation of pressure at the outlet of any one meter on the system shall never exceed four inches of water pressure above or below the normal pressure maintained at such point of delivery, unless it can be shown to the Commission that such greater variation is due to extraordinary demand in extreme weather.

Provided, That variations in pressure caused by operation of consumer's apparatus in violation of contract or the rules of the utility, or by causes entirely beyond the control of the utility, shall not be considered a violation of this rule.

III.—*Required Heating Value:*

Each utility furnishing manufactured gas service must supply gas which when tested within a one mile radius from the point of manufacture, shall give a monthly average of not less than 570 British thermal units total heating value per cubic foot, as referred to standard condition of temperature and pressure, except gas which in the opinion of the Commission is produced as a by-product in the manufacture of coke, which gas shall give a monthly average of not less than 550 British thermal units per cubic foot. The minimum heating value of manufactured gas shall never fall below 520 British thermal units except for by-product coke oven gas as indicated above, which shall never fall below 500 British thermal units. Manufactured gas delivered to the mains under pressure above five pounds per square inch shall be tested for heating value before compression. The minimum heating value of natural gas supplied by any utility shall never fall below 800 British thermal units per cubic foot, as referred to standard condition of temperature and pressure.

IV.—*Sulphur Requirements:*

In no case shall manufactured gas contain more than 30 grains of total sulphur per 100 cubic feet.

V.—*Service Interruptions:*

Each utility shall keep a record of all interruptions to service on the entire system or any portion thereof belonging to the utility, which record shall contain the time, extent and duration of the interruption, and shall be kept as specified in Rule IX.

VI. *Complaint Records:*

Each utility shall keep a record of all written complaints received from its consumers in regard to service, which record shall show the name and address of the complainant, the date and nature of the complaint, the action taken, and the date of final disposition of the matter. This record shall be kept as specified in Rule IX.

VII.—*Inspection of Equipment:*

Each utility shall inspect its equipment and facilities, including the necessary tests for water and leaks in its lines, in accordance with good practice, and in a manner satisfactory to the Commission, and shall maintain as specified in Rule IX, a complete record of all such inspections and tests, and shall file with the Commission a statement of the condition of its equipment and facilities, and such copies of its reports of inspections, when and in such form as the Commission may require.

VIII.—*Accidents:*

Each utility shall keep a record of and shall furnish to the Investigator of Accidents for the Commission, in accordance with the rules of the Commission, reports of any and all accidents happening in or about or in connection with the operation of its property, facilities or service, wherein any person shall have been killed or injured, or property damaged or destroyed, with a full statement as far as possible of the causes of such accidents, and the precautions, if any, taken as prevention against future accidents of similar character.

IX.—*Records and Reports:*

All records required by these rules shall be kept within the State at an office or offices of the utility located in the territory served by it, and shall be open for examination by the Commission or its representative. Each utility shall notify the Commission of the office or offices at which the various classes of records are kept and shall file with the Commission, such reports as the Commission may from time to time require.

Part II.

METERS, CALORIMETERS, ETC.

X.—*Allowable Error:*

No gas meter shall be placed in service nor allowed to remain in service, which shows in comparison with a standard gas prover, an error greater than two (2%) per cent. when gas at the standard test rate of flow is passing through it.

XI.—*Periodic Tests:*

No utility furnishing metered gas service shall allow a gas meter to remain in service for a period longer than five years without checking it for accuracy, or readjusting it if found to be incorrect beyond the limits established by Rule X. Proportional meters shall be tested once every five years and readjusted if necessary, and cleaned by a competent man at least once each three months.

XII.—*Meter Test Records:*

Whenever a gas service meter is tested, the original test record shall be kept, indicating the information necessary for identifying the meter, the reason for making the test, the reading of the meter before being disturbed, and the accuracy of the meter, together with all the data taken at the time of the test. This record must be sufficiently complete to permit the convenient checking of the methods employed, and the calculations made. A record shall also be kept, preferably numerically arranged, indicating date of meter purchase, when purchased after July 1, 1914, name of manufacturer, its size, its identification, its various places of installation, with dates of installation and removal, and the dates and general results of all tests. These records shall be kept as specified in Rule IX.

XIII.—*Installation of Meters:*

Each gas service meter installed after July 1, 1914, shall have been tested for accuracy by the utility within one year previous to its installation. It shall also be inspected by the utility for proper connections, mechanical conditions, and suitability of location within sixty (60) days after installation.

XIV.—*Facilities for Testing:*

Each utility shall provide and maintain suitable and adequate facilities for testing its gas service meters, in each case to be satisfactory to and approved by the Commission. Each utility shall provide a suitable meter prover, of not less than five (5) cubic feet capacity, equipped with suitable thermometers and other necessary accessories, and shall maintain the same in proper adjustment to register the condition of the meters within one-half of one per cent. The accuracy of all provers will be established from time to time by a representative of the Commission at a place to be designated by it. After January 1, 1915, tests made with an uncertified prover will not be deemed authoritative.

XV.—*Pressure Surveys:*

Each utility shall provide itself with one or more graphic recording pressure gauges, and shall make frequent measurements of the gas pressure variation throughout its system. Charts from these gauges showing the pressure variations shall be kept for at least two years as specified in Rule IX. The accuracy of all pressure gauges will be established from time to time by a representative of the Commission at a place to be designated by it. After January 1, 1915, tests made with an uncertified pressure gauge will not be deemed authoritative.

XVI.—*Calorimeter Tests:*

Each utility whose gas output exceeds twenty million cubic feet per year shall equip itself with a complete standard calorimeter outfit approved by the Commission, by which it shall determine the heat value of manufactured gas at least three days each week, and of natural gas at least three times per year. A complete record of all these tests shall be kept as specified in Rule IX. The accuracy of all calorimeters will be established from time to time by a representative of the Commission at a place to be designated by it. After January 1, 1915, tests made with an uncertified calorimeter will not be deemed authoritative.

XVII.—*Meters in Service without Test Records:*

All gas meters in service after July 1, 1914, for which there is no record test within five years, must be tested as soon thereafter as circumstances will permit, and in all cases within three years from July 1, 1914.

XVIII.—*Request Tests:*

Each utility shall upon the written request of a consumer, and if he so desires, in his presence or that of his authorized representative, make a test of the accuracy of his meter. When a consumer desires, either personally or through a representative, to witness the testing of a meter, he may require the meter to be sealed in his presence before removed, which seal shall not be broken until the test is made in his presence. If the meter so tested shall be found to be accurate within the limits specified in Rule X, a fee determined from the schedule indicated below, shall be paid to the utility by the consumer requiring such test; but if not so found, then the cost thereof shall be borne by the utility furnishing the service. When making such request, the consumer shall agree to the basis of payment herein specified. A report of such test shall be made to the consumer, and a complete record of such test shall be kept on file as specified in Rule IX.

The amount of the fee to be charged by the utility for testing meters upon written complaint of consumers, shall be determined by the manufacturers' designated rating, as follows:

Meters of 10-Lt. capacity or under, or having a rated capacity of 200 cubic feet per hour or under,	\$2 00
Meters of over 10-Lt. capacity and not exceeding 30-Lt. capacity, or having a rated capacity exceeding 200 cubic feet per hour, and not exceeding 600 cubic feet per hour,	4 00
Meters of over 30-Lt. capacity and not exceeding 80-Lt. capacity, or having a rated capacity exceeding 600 cubic feet per hour, and not exceeding 1,500 cubic feet per hour,	6 00
Meters of over 80-Lt. capacity, or having a rated capacity exceeding 1,500 cubic feet per hour,	10 00

PROPORTIONAL METERS.

All Proportional Meters not exceeding 15,000 cubic feet per hour rated capacity,	15 00
All Proportional Meters of over 15,000 cubic feet and not exceeding 30,000 cubic feet per hour,	20 00
All Proportional Meters of over 30,000 cubic feet and not exceeding 50,000 cubic feet per hour rated capacity,.....	30 00
All Proportional Meters of over 50,000 cubic feet and not exceeding 100,000 cubic feet per hour rated capacity,.....	40 00
All Proportional Meters of over 100,000 cubic feet per hour rated capacity,..	50 00

Rates for testing meters not included in the above classification, or which are so located that the cost is out of proportion to the fee specified, will be furnished by the Commission upon receipt of complete specifications.

XIX.—*Refunds:*

If a meter be found to be fast at any test by more than two (2%) per cent., an allowance or refund shall be made to the consumer by the utility, equal to all the excess charged the consumer, figured back from the date of test through the entire period of the current bill, unless it can be shown that the error is due to an accident or other cause the exact date of which can be determined, in which case it shall be figured back to such time.

5—COMMENTS ON THE RULES FOR REGULATING GAS UTILITIES.

The following comments were made by Prof. Fernald, who prepared the Rules for Gas Utilities, under the supervision of Commissioner Tone, and in co-operation with Prof. Harris:

Required Heating Valve:

For a great many years, the quality of gas was largely determined by means of the so-called candle power requirement, and many ordinances and regulations still cling to the candle power test. When open flame gas burners were in general use, the candle power standard was undoubtedly the most effective and altogether the most satisfactory one. Today, however, when probably not over ten per cent. of the total gas used is consumed in open burners it is questionable whether the candle power standard is of any real service in determining gas quality. For use in connection with gas ranges for cooking, incandescent mantles for lighting, furnaces, ovens and pits for heating, and gas engines for power development, a quality requirement based on the heating value of the gas seems to be more consistent to day than a candle power requirement, and the double standard recommended by some seems quite unnecessary. Experts in the field of gas manufacture seem to be almost unanimous in the feeling that proper regulation of heating value can be more readily obtained than of candle power. They are, therefore, distinctly of the opinion that in general the one standard, heating value, is the desirable one. It is undoubtedly true that in certain sections of the older cities of Pennsylvania open flame burners are more or less in use, and it is possible that in a few of these cities these burners may utilize as much as 25 per cent. of the gas supplied to these communities, but these burners are rapidly being displaced by the mantle type, and when natural gas is taken into consideration, it is probable that the total gas utilized in open flame burners will fall well below the 10 per cent. limit indicated above. The need, therefore, of the candle power standard seems to be obsolete. Assuming that, for state regulation, the single standard of heating value is to be adopted, it becomes necessary to determine the definite heating values which shall serve as limits in the regulations imposed. At least two heating value standards must be recognized, one for manufactured gas and one for natural gas.

Several kinds of manufactured gas have to be considered. At present these are coal gas, carbureted water gas, coke oven gas, mixed gas and oil gas. Coal gas is made by the destructive distillation of coal in retorts which are externally heated. Approximately 5 cubic feet of gas are secured per pound of coal, and the heat value of such gas usually ranges from 550 to 630 B. t. u. per cubic foot. Carbureted water gas is the result of a combination of two gas-making processes. Water gas is generated by turning a jet of steam upon an incandescent fuel bed. This water gas is usually enriched by the addition of gas generated from oil, the resultant gas being known as carbureted water gas. The larger portion of the illuminating gas in this country is of this type. Carbureted water gas usually has a heating value ranging from 500 to 650 B. t. u. per cubic foot. Coke oven gas is practically a regular coal gas but the process of manufacture is somewhat different from that of the so-called coal gas. The primary object of the coke plant is the manufacture of coke, and the gas generated is practically a by-product. The heating value of coke oven gas is usually somewhat lower than that of ordinary coal gas. Mixed gas—many plants today are manufacturing a so-called mixed gas which is nothing more or less than a mechanical mixture of carbureted water gas and coal or coke oven gas. Oil gas:—In the oil districts of the country large quantities of gas are made directly from crude oil.

In determining the proper standard for the heating value of gas in any community it is essential that the types of gas manufactured in that territory be carefully considered, and that the efficiency of the processes of manufacture or the individual standards of the companies furnishing this commodity be taken into account when first establishing a basis for regulation. This is essential because it is important that sufficient leeway be granted to meet the commercial conditions involved in the manufacture of the different types of gas of reasonable quality supplied in the different sections of a State. It should further be recognized that to impose too rigorous conditions during the early application of new laws may mean either excessive expense to the smaller companies, resulting in an abnormal increase in the cost of gas to the public, or the impossibility on the part of the utility to carry out the requirements imposed. An examination of the heating value standards of various states and cities shows the average to be about 600 B. t. u. per cubic foot; but in the majority of these cases the gas is limited to three varieties, namely, coal gas, carbureted water gas or mixed gas. It is usually customary in all such regulations to permit a maximum variation of 50 heat units below the average monthly requirements, that is, the usual stipulation is that the utility furnishing manufactured gas service must supply gas of not less than 600 B. t. u. total heating value per cubic foot as referred to standard conditions of temperature and pressure, and that the minimum heating value shall never fall below 550 B. t. u.

It is undoubtedly true that many companies are to day manufacturing gas of a considerably lower heat value than they imagine. Owing to the fact that they have not been working under strict regulations they have never actually made any heat value determinations, but assume that the gas which they manufacture is necessarily equal in heat value to that of certain other plants from which they have obtained information. A recent report of a joint committee on calorimetry of the public service commission and gas corporations of a state that has been living under gas regulation for several years, indicates that even without considering coke oven gas, the 600 heat unit standard seems high, and this committee has seen fit to recommend an average standard of 570 B. t. u. If coke oven gas becomes an important factor, it seems consistent to make the standard even lower than that recommended by this committee.

As a summary of the various recommendations and regulations now in force, the following requirements seem consistent for the best results to day:

For states already working under gas regulations and in which the manufactured gas supply consists entirely of coal gas, carbureted water gas and mixed gas, a standard of 570 B. t. u. per cubic foot for the monthly average seems to be very satisfactory, although for states in which gas regulation is just being introduced or in which coke oven gas plays an important part, this heat value standard may in some instances be wisely reduced slightly below these figures, with a minimum in each case, as previously outlined, of 50 heat units below the monthly average.

The heat value of natural gas ranges from about 700 to over 1,100 B. t. u. per cubic foot. It seems to be consistent to require a quality of natural gas that shall insure a heat value of not less than 800 heat units as a minimum. These heat value determinations of the gas are made on the basis of recognized standard conditions of temperature and pressure.

Bearing the above points in mind, the following rules for *required heating value* as adopted by the Public Service Commission of the Commonwealth of Pennsylvania, seem to be entirely consistent:

Each utility furnishing manufactured gas service must supply gas, which, when tested within a one mile radius from the point of manufacture, shall give a monthly average of not less than 570 British thermal units total heating value per cubic foot, as referred to standard conditions of temperature and pressure, except gas, which, in the opinion of the Commission, is produced as a by-product in the manufacture of coke, which gas shall give a monthly average of not less than 550 British thermal units per cubic foot. The minimum heating value of manufactured gas shall never fall below 520 British thermal units except for by-product coke oven gas as indicated above, which shall never fall below 500 British thermal units. Manufactured gas delivered to the mains under pressures above 5 pounds per square inch, shall be tested for heating value before compression. The minimum heating value of natural gas supplied by any utility shall never fall below 800 British thermal units per cubic foot, as referred to standard conditions of temperature and pressure.

Gas manufacturers who have been accustomed to no special standards can undoubtedly improve the uniformity of the quality of the gas supplied by their plants, and it may prove consistent for the State Commission to increase these requirements from time to time.

Sulphur Requirements:

The phrase "quality of gas" not only relates to its heating value, but also to freedom from impurities. Manufacturers of gas are expected satisfactorily to control, among other impurities, the proportions of hydrogen sulphide, total sulphur and ammonia. Gas engineers seem to differ radically as to the seriousness of a trace of hydrogen sulphide in gas. Some claim that a trace does absolutely no harm save that the odor produced when the gas is burned is objectionable. Others claim that this odor serves a useful purpose in warning of leaks or open valves. The removal of hydrogen sulphide is a comparatively simple process, and the gas company that has any interest in the attitude of its customers will see that its gas is free from this somewhat offensive impurity. It seems, therefore, hardly necessary

to include any requirements regarding hydrogen sulphide, but gas regulations should specify the total amount of sulphur that will be permitted, inasmuch as it is quite possible in good practice with the grades of coal used to day to reduce the amount of sulphur to 20 grains or less per 100 cubic feet of gas produced. It has become customary to make the maximum limit as prescribed in the regulations of the Pennsylvania Commission, 30 grains of total sulphur per 100 cubic feet. This serves as a regulator, and at the same time cannot be regarded as a hardship.

Pressure Variation:

The regulation of the pressure at which gas is supplied to the customer's appliances seems to be imperative if service is to be of a thoroughly satisfactory nature. This is emphasized distinctly in the following passage from the 1909 report of the Wisconsin Railroad Commission:

"It has been shown that in general the gas furnished in cities of this state has been of good quality and the value has been uniform. In spite of this fact, complaint is frequently heard of 'poor gas.' The summary of gas complaints and our own experience have shown "poor gas," as the consumer uses the term, to be synonymous with "poor pressure" and may be due to one or more of a number of causes. It may be that the pressure furnished to the mains is inadequate, that the service or house piping is inadequate or otherwise faulty, or that the pressure is unsuited to the adjustment of the appliances in which gas is used. In most cases, however, it goes back to the matter of pressure. For this reason, the control of the gas pressure is the most important single factor in securing satisfactory service. The use of gas has been greatly extended in the last few years, and all of the appliances which have come into use require a higher pressure than the old open flame burner. It is stated in the discussion of pressure in a former bulletin that the pressure under $1\frac{1}{2}$ inches is unsatisfactory. Most of the companies in the state maintain a standard pressure of about $2\frac{1}{2}$ inches, and it has been noticed in general, where the pressure drops below two inches, complaints are heard."

Owing to this tendency to increase gas pressures, the majority of gas appliances are to-day regulated for pressures of from 2 to 6 inches of water pressure when operating on manufactured gas, and for a somewhat higher range of pressures when operating on natural gas. Experience seems to show that the most satisfactory results are secured with incandescent mantles, gas ranges and other household appliances when the pressure is greater than 2 inches. When gas appliances have been adjusted for certain definite pressures it is exceedingly difficult to get satisfactory results if the pressure is allowed to fluctuate through wide ranges or at frequent intervals. It becomes incumbent upon the gas companies, therefore, to hold pressures within certain ranges and to control the daily variation within reasonable limits.

The following pressure requirements adopted by the Pennsylvania Commission seemed to protect the public on the one hand, and to be entirely fair to the utility on the other:

Each utility furnishing manufactured gas shall maintain at the consumer's meter outlet a gas pressure of not less than one and one-half inches nor more than eight inches of water pressure; and within said limits the daily variation of pressure at the outlet of any one meter on the system shall never be greater than one hundred (100%) per cent. of the minimum pressure. Each utility furnishing natural gas shall maintain at the consumer's meter outlet a gas pressure not less than one and one-half inches, nor more than fourteen inches of water pressure, except when greater pressure is specifically provided in the contract between the utility and the consumer, provided there shall be no unfair and unreasonable dis-

crimination or preference; and within the said limits the daily variation of pressure at the outlet of any one meter on the system shall never exceed four inches of water pressure above or below the normal pressure maintained at such point of delivery, unless it can be shown to the Commission that such greater variation is due to extraordinary demand in extreme weather. Provided, That variations in pressure caused by operation of consumer's apparatus in violation of contract or the rules of the utility, or by causes entirely beyond the control of the utility, shall not be considered a violation of the rule.

Measurement of Commodity Supplied:

In order that the consumer may be assured of the correctness of bills submitted for service rendered, it becomes imperative that some definite standard of reliability be adopted for meters used in measuring gas, heat or water. In general, it has been found that the accuracy of properly constructed meters may easily be maintained within a very small percentage when used under suitable conditions. An examination of the degree of accuracy, common in commercial use, will establish the consistency of the following rules relating to the allowable error:

"No gas meter shall be placed in service nor allowed to remain in service, which shows in comparison with a standard gas prover, an error greater than two (2%) per cent. when gas at the standard test rate of flow is passing through it."

It also becomes important in the interest of good service that the accuracy of such meters shall be definitely checked periodically. Each utility should, then, be required to check the accuracy of all meters within stated periods, and to re-adjust them if found to be incorrect. The propriety of the following rules is, therefore, apparent:

"No utility furnishing metered gas shall allow a gas meter to remain in service for a period longer than five years without checking it for accuracy, or readjusting it if found to be incorrect beyond the limits established by Rule X. Proportional meters shall be tested once every five years and readjusted if necessary, and cleaned by a competent man at least once each three months."

From time to time, consumers feel that their meters are inaccurate, and that their bills are excessive. Although meters may register in favor of the utility, yet, as a rule, when they are in error, their registration is favorable to the consumer. The impression regarding the inaccuracy of the meter is sometimes due to natural but overlooked causes, such as extreme weather conditions, social functions or other temporary but excessive demands. It is customary, therefore, to make provision for the checking of any meter at the request of any consumer under certain specific conditions. Among other conditions imposed, it seems consistent to require the consumer to pay a reasonable fee for such special test if the meter so tested shall be found to be accurate within the limits specified by the regulations, but if the meter is not so found, then the cost of the test should not fall upon the consumer. Similarly, if the meter be found to be fast by more than a fixed percentage, an allowance or refund should be made to the consumer by the utility.

In connection with the checking of meters, it becomes incumbent upon the utility to provide and maintain suitable and adequate facilities for testing meters, gauges, calorimeters and other required accessories. The facilities for testing must of necessity be satisfactory to and approved by the Commission.

Continuity of Service:

Satisfactory service from a utility implies continuity of service at all times during the prescribed periods for which such service is supposedly rendered, together with the reasonable protection from injury to persons or property resulting from defective equipment or carelessness. With these points in view, the service regulations require of the utilities inspection of their equipment and facilities in a manner satisfactory to the Commission.

As a means of protection to both the utility and the consumer, and in order to supply the Commission with the essential facts in case of controversy, it becomes incumbent upon the utility to keep reliable records and reports of the conditions found upon inspection, of all written complaints received from its customers in regard to service, of interruptions to service and of any and all accidents related in any way to the companies' equipment or facilities.

6—HEATING SERVICE UTILITIES.

Circular No. 11-A.

RULES AND REGULATIONS

Adopted April 9, 1914.

THE PUBLIC SERVICE COMMISSION
of the
COMMONWEALTH OF PENNSYLVANIA.

Part I.

GENERAL.

Definition:

The term "utility" as used in these rules includes all public service companies, corporations and persons, as defined in The Public Service Company Law, engaged in the production, sale or distribution of heat within the jurisdiction of the Commission.

I.—Statutory:

"It shall be the duty of every public service company to furnish and maintain such service, including facilities, as shall in all respects be just, reasonably adequate, and practically sufficient for the accommodation and safety of its patrons, employees, and the public, and in conformity with such reasonable regulations or orders as may be made by the Commission."

II.—Service Interruptions:

Each utility shall keep a record of all interruptions to service on the entire system or any portion thereof, belonging to the utility, which record shall contain the time, cause, extent and duration of the interruption, and shall be kept as specified in Rule VI.

III.—*Complaint Record:*

Each utility shall keep a record of all written complaints received from its consumers in regard to service, which record shall show the name and address of the complainant, the date and nature of the complaint, the action taken, and the date of final disposition of the matter. This record shall be kept as specified in Rule VI.

IV.—*Inspection of Equipment:*

Each utility shall inspect its equipment and facilities, in accordance with good practice, and in a manner satisfactory to the Commission, and shall maintain a complete record of all such inspections and tests as specified in Rule VI.

V.—*Accidents:*

Each utility shall keep a record of and shall furnish to the Investigator of Accidents for the Commission, in accordance with the rules of the Commission, reports of any and all accidents happening in or about or in connection with the operation of its property, facilities or service, wherein any person shall have been killed or injured, or property damaged or destroyed, with a full statement as far as possible of the causes of such accidents, and the precautions, if any, taken as prevention against future accidents of similar character.

VI.—*Records and Reports:*

All records required by these rules shall be kept within the State at an office or offices of the utility located in the territory served by it, and shall be open for examination by the Commission or its representative. Each utility shall notify the Commission of the office or offices at which the various classes of records are kept, and shall file with the Commission such reports as the Commission may from time to time require.

Part II.

METERS

VII.—*Allowable Error:*

No condensation meter or hot water meter shall be placed in service nor allowed to remain in service, which has an error in registration of more than four (4%) per cent. when the water at its average temperature and standard test rate of flow is passing through the meter.

VIII.—*Periodic Tests:*

No utility furnishing metered heating service shall allow a condensation meter to remain in service for a period longer than two years, or hot water meter to remain in service for a period longer than four years, without checking it for accuracy and readjusting it if found to be incorrect beyond the limits established by Rule VII.

IX.—*Meter Test Records:*

Whenever a heating service meter is tested, the original test record shall be kept as specified in Rule VI. This record shall indicate the information necessary for identifying the meter, the reason for making the test, the reading of the meter before being disturbed, and the accuracy of the meter, together with all data taken at the time of the test. This record must be sufficiently complete to permit the convenient checking of the methods employed and the calculations made. A record shall also be kept, preferably numerically arranged, indicating date of meter purchase, when purchased after July 1, 1914, name of manufacturer, its size, identification, its various places of installation with dates of installation and removal, and the dates and general results of all tests.

X.—*Installation of Meters:*

Each heating service meter installed after July 1, 1914, shall have been tested for accuracy by the utility within one year previous to its installation. It shall also be inspected by the utility for proper connections, mechanical conditions, and suitability of location within sixty (60) days after installation.

XI.—*Facilities for Testing:*

Each utility shall provide and maintain suitable and adequate facilities for testing its heating service meters, in each case to be satisfactory to and approved by the Commission. Each utility shall own a complete meter testing equipment of a form approved by the Commission. The accuracy of this testing equipment shall be established from time to time by a representative of the Commission at a place to be designated by it. After January 1, 1915, tests made with uncertified equipment will not be deemed authoritative.

XII.—*Meters In Service Without Test Records:*

All condensation meters in service on and after July 1, 1914, for which there is no record of test within two years, must be tested as soon thereafter as circumstances will permit, and in all cases within twelve months from July 1, 1914. All hot water meters in service on and after July 1, 1914, for which there is no record of test within four years, shall be tested as soon thereafter as circumstances will permit, and in all cases within twelve months from July 1, 1914.

XIII.—*Request Tests:*

Each utility shall, upon the written request of a consumer, and if he so desires, in his presence or that of his authorized representative, make a test of the accuracy of his meter. When a consumer desires, either personally or through a representative, to witness the testing of a meter, he may require the meter to be sealed in his presence before removal, which seal shall not be broken until the test is made in his presence. If the meter so tested shall be found to be accurate within the limits specified in Rule VII, a fee determined from the schedule indicated below shall be paid to the utility by the consumer requiring such test; but if not so found, then the cost thereof shall be borne by the utility furnishing the service. When making such request, the consumer shall agree to the basis of payment herein specified. A report of such test shall be made to the consumer, and a complete record of such test shall be kept as specified in Rule VI. The amount of the fee

shall be two dollars for each heating service meter having an outlet not exceeding one inch for hot water meters and an inlet not exceeding one inch for condensation meters; for other hot water meters having an outlet not exceeding two inches, the test fee shall be five dollars per meter. Rates for meters not included in the above classification, or which are so located that the cost is out of proportion to the fee specified, will be furnished by the Commission upon receipt of complete specifications.

XIV.—*Refunds:*

If a meter be found to be fast at any test by more than four (4%) per cent. an allowance or refund shall be made to the consumer by the utility, equal to all the excess charged the consumer, figured back from the date of test through the entire period of the current bill, unless it can be shown that the error is due to an accident or other cause, the exact date of which can be determined, in which case it shall be figured back to such time.

7—WATER SERVICE UTILITIES.

Circular No. 12-A.

RULES AND REGULATIONS

Adopted April 9, 1914.

THE PUBLIC SERVICE COMMISSION
of the
COMMONWEALTH OF PENNSYLVANIA.

Part I.

GENERAL.

Definition:

The term "utility" as used in these rules includes all public service companies, corporations and persons, as defined in The Public Service Company Law, engaged in the sale or distribution of water within the jurisdiction of the Commission.

I.—*Statutory.*

"It shall be the duty of every public service company to furnish and maintain such service, including facilities, as shall in all respects be just, reasonably adequate and practically sufficient for the accommodation and safety of its patrons, employees, and the public, and in conformity with such reasonable regulations or orders as may be made by the Commission."

II.—*Service Interruptions:*

Each utility shall keep a record of all interruptions to service on the entire system or any portion thereof, belonging to the utility, which record shall contain the time, cause, extent and duration of the interruption, and shall be kept as specified in Rule VI.

III.—*Complaint Records:*

Each utility shall keep a record of all written complaints received from its consumers in regard to service, which record shall show the name and address of the complainant, the date and nature of the complaint, the action taken and the date of final disposition of the matter. These records shall be kept as specified in Rule VI.

IV.—*Inspection of Equipment:*

Each utility shall inspect its equipment and facilities, in accordance with good practice, and in a manner satisfactory to the Commission, and shall keep a complete record of all such inspections and tests as specified in Rule VI.

V.—*Accidents:*

Each utility shall keep a record of and shall furnish to the Investigator of Accidents for the Commission, in accordance with the rules of the Commission, reports of any and all accidents happening in or about or in connection with the operation of its property, facilities or service, wherein any person shall have been killed or injured, or property damaged or destroyed, with a full statement as far as possible of the causes of such accidents, and the precautions, if any, taken as prevention against future accidents of similar character.

VI.—*Records and Reports:*

All records required by these Rules shall be kept within the State, at an office or offices of the utility located in the territory served by it, and shall be open for examination by the Commission or its representative. Each utility shall notify the Commission of the office or offices at which the various classes of records are kept, and shall file with the Commission such reports as the Commission may from time to time require.

Part II.

METERS.

VII.—*Allowable Error:*

No water meter shall be placed in service nor allowed to remain in service, which has an error in registration of more than four (4%) per cent. when water is passing through it at approximately the following rates of flow:

- $\frac{5}{8}$ inch meter, 6 gallons per minute;
- $\frac{3}{4}$ inch meter, 10 gallons per minute;
- 1 inch meter, 20 gallons per minute;
- $1\frac{1}{2}$ inch meter, 30 gallons per minute;

- 2 inch meter, 50 gallons per minute;
- 3 inch meter, 90 gallons per minute;
- 4 inch meter, 180 gallons per minute;
- 6 inch meter, 300 gallons per minute;

VIII.—*Periodic Tests:*

No utility furnishing metered water service shall allow a water meter to remain in service for a period longer than or for a registration greater than that specified in the following table, without checking it for accuracy, and readjusting it if found to be incorrect beyond the limits established in Rule VII.

- $\frac{5}{8}$ inch meter, 10 years or 100,000 cubic feet;
- $\frac{3}{4}$ inch meter, 8 years or 150,000 cubic feet;
- 1 inch meter, 6 years or 300,000 cubic feet;
- All meters above 1 inch, 4 years.

IX.—*Meter Test Records:*

Whenever a water service meter is tested, the original test record shall be kept as specified in Rule VI, indicating the information necessary for identifying the meter, the reason for making the test, the reading of the meter before being disturbed, and the accuracy of the meter, together with all data taken at the time of the test. This record must be sufficiently complete to permit the convenient checking of the methods employed and the calculations made. A record shall also be kept, preferably numerically arranged, indicating date of meter purchase, when purchased after July 1, 1914, name of manufacturer, its size, its identification, its various places of installation with dates of installation and removal, and the dates and general results of all tests.

X.—*Installation of Meters:*

Each water service meter installed after July 1, 1914, shall have been tested for accuracy by the utility within one year previous to its installation. It shall also be inspected by the utility for proper connections, mechanical condition, and suitability of location within sixty (60) days after installation.

XI.—*Facilities for Testing:*

Each utility shall provide and maintain suitable and adequate facilities for testing its water service meters, in each case to be satisfactory to and approved by the Commission. Each utility shall own a complete testing equipment of a form approved by the Commission. The accuracy of the testing equipment will be established from time to time by a representative of the Commission at a place to be designated by it. After January 1, 1915, tests made with uncertified equipment will not be deemed authoritative.

XII.—*Meters in Service Without Test Records:*

All water meters in service on or after July 1st, 1914, for which there is no record of test within five years, must be tested as soon thereafter as circumstances will permit, and in all cases within two years from July 1, 1914.

XIII.—*Request Tests.*

Each utility shall upon the written request of a consumer and if he so desires, in his presence or that of his authorized representative, make a test of the accuracy of his meter. When a consumer desires, either personally or through a representative, to witness the testing of a meter, he may require the meter to be sealed in his presence before removal, which seal shall not be broken until the test is made in his presence. If the meter so tested shall be found to be accurate within the limits herein specified, a fee determined from the schedule indicated below, shall be paid to the utility by the consumer requiring such test; but if not so found, then the cost thereof shall be borne by the utility furnishing the service. When making such request the consumer shall agree to the basis of payment herein specified. A report of such test shall be made to the consumer, and a complete record of such test shall be kept as specified in Rule VI. The amount of fee shall be two dollars for each water service meter having an outlet not exceeding one inch; for other water service meters having an outlet not exceeding two inches, the test fee shall be five dollars per meter.

Rates for testing meters not included in the above classification, or which are so located that the cost is out of proportion to the fee specified, will be furnished by the Commission upon receipt of complete specifications.

XIV.—*Refunds:*

If a meter be found to be fast at any test by more than four (4%) per cent., an allowance or refund shall be made to the consumer by the utility, equal to all the excess charged the consumer, figured back from the date of test through the entire period of the current bill, unless it can be shown that the error is due to an accident or other cause, the exact date of which can be determined, in which case it shall be figured back to such time.

S—COMMENTS ON THE RULES FOR REGULATING HEATING AND WATER SERVICE UTILITIES.

The following comments were made by Prof. Fernald, who prepared the Rules for Heating and Water Utilities under the supervision of Commissioner Tone and in co-operation with Prof. Harris:

Heat and Water Service:

Owing to the nature of the commodities furnished by the utilities engaged in the sale or distribution of heat or water, no detailed requirements regarding the quality of the commodity need be specified beyond the general requirements of the statutory clause upon which the rules of the Commission are based. This clause reads:

"It shall be the duty of every public service company to furnish and maintain such service, including facilities, as shall in all respects be just, reasonably adequate, and practically sufficient for the accommodation and safety of its patrons, employees, and the public, and in conformity with such reasonable regulations or orders as may be made by the Commission."

Measurement of Commodities Supplied:

In order that the consumers may be assured of the correctness of bills submitted for service rendered, it becomes imperative that some definite standard of reliability be adopted for meters used in measuring gas, heat or water. In general, it has been found that the accuracy of properly constructed meters may easily be maintained within a very small percentage when used under suitable conditions. An examination of the degree of accuracy, common in commercial use, will establish the consistency of the following rules relating to the allowable error:

(a) No condensation meter or hot water meter shall be placed in service nor allowed to remain in service which has an error in registration of more than four (4%) per cent. when the water at its average temperature and standard test rate of flow is passing through the meter.

(b) No water meter shall be placed in service nor allowed to remain in service, which has an error in registration of more than four (4%) per cent. when water is passing through it at approximately the following rates of flow:

$\frac{1}{8}$ inch meter,	6 gallons per minute;
$\frac{1}{4}$ inch meter,	10 gallons per minute;
1 inch meter,	20 gallons per minute;
$1\frac{1}{2}$ inch meter,	30 gallons per minute;
2 inch meter,	50 gallons per minute;
3 inch meter,	90 gallons per minute;
4 inch meter,	180 gallons per minute;
6 inch meter,	300 gallons per minute;

The rates of flow established for the water meters represent approximately one-third of the catalogue rate prescribed for such meters, as this one-third basis seems to represent approximately average service conditions.

It also becomes important in the interest of good service that the accuracy of such meters shall be definitely checked periodically. Each utility should, then, be required to check the accuracy of all meters within stated periods and to readjust them if found to be incorrect. The propriety of the following rules is, therefore, apparent:

(a) No utility furnishing metered heating service shall allow a condensation meter to remain in service for a period longer than two years, or hot water meter to remain in service for a period longer than four years, without checking it for accuracy and readjusting it if found to be incorrect beyond the limits established by Rule VII.

(b) No utility furnishing metered water service shall allow a water meter to remain in service for a period longer than, or for a registration greater than, that specified in the following table, without checking it for accuracy, and readjusting it if found to be incorrect beyond the limits established in Rule VII.

$\frac{1}{8}$ inch meter,	10 years or 100,000 cubic feet;
$\frac{1}{4}$ inch meter,	8 years or 150,000 cubic feet;
1 inch meter,	6 years or 300,000 cubic feet;
All meters above 1 inch, 4 years.	

From time to time, consumers feel that their meters are inaccurate and that their bills are excessive. Although meters may register in favor of the utility, yet as a rule, when they are in error, their registration is favorable to the consumer. The impression regarding the inaccuracy of the meter is sometimes due to natural but overlooked causes, such as, extreme weather conditions, social functions or other temporary but excessive demands. It is customary, therefore, to make provision for the checking of any meter at the request of any consumer under certain specific conditions. Among other conditions imposed, it seems consistent to require the consumer to pay a reasonable fee for such special test if the meter so tested shall be found to be accurate within the limits specified by the regulations, but if

the meter is not so found, then the cost of the test should not fall upon the consumer. Similarly, if the meter be found to be fast by more than a fixed percentage, an allowance or refund should be made to the consumer by the utility.

In connection with the checking of meters, it becomes incumbent upon the utility to provide and maintain suitable and adequate facilities for testing meters, gauges, and other required accessories. The facilities for testing must of necessity be satisfactory to and approved by the Commission.

Continuity of Service:

Satisfactory service from a utility implies continuity of service at all times during the prescribed periods for which such service is supposedly rendered, together with the reasonable protection from injury to persons or property resulting from defective equipment or carelessness. With these points in view, the service regulations require of the utilities inspection of their equipment and facilities in a manner satisfactory to the Commission.

As a means of protection to both the utility and the consumer, and in order to supply the Commission with the essential facts in case of controversy, it becomes incumbent upon the utility to keep reliable records and reports of the conditions found upon inspection, of all written complaints received from its customers in regard to service, of interruptions to service and of any and all accidents related in any way to the companies' equipment or facilities.

9—SUMMARY OF REGULATION OF THE FOUR UTILITIES:

Modern business methods accompanied by improved systems of manufacture and distribution, have tended toward a reduction in the prices of several commodities furnished by public utilities, but in many cases this reduction has been largely offset by the increased cost of materials, fuel and labor. Higher standards of service are demanded by the public, but any attempt on the part of the utility to increase prices is met with stubborn resistance. Disinterested, impartial and fair regulation is needed in such cases. The Public Service Commission is established for adjusting such matters, and the public should recognize the propriety of an increase in the price of a commodity just as much as a decrease, when the character of the service rendered warrants it or requires it in order to guarantee a reasonable financial return.

It is recognized that it is to day the policy of many utilities to maintain standards of service that are superior to any demands made by the regulations adopted by The Public Service Commission of Pennsylvania. There are, however, companies in every community that have never known any standard, and a definite basis for their future procedure is required. It is believed that a just and reasonable application of the regulations adopted will result in high standards of service, uniformly fair prices, reasonable financial returns and a more cordial relation between the public and the utilities.

PART FOUR

IMPROVEMENT OF THE PORT OF PHILADELPHIA

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- I. INTRODUCTION.
 - II. PRESENT CONDITIONS AND PROSPECTS OF THE PORT.
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PART FOUR

IMPROVEMENT OF THE PORT OF PHILADELPHIA

I. INTRODUCTION.

STATE LAWS AND STATE APPROPRIATIONS.

The State of Pennsylvania has assumed joint responsibility with the City of Philadelphia for the regulation and improvement of the Port of Philadelphia.

1—*The Port Warden Law of 1803.*

In 1803, the General Assembly established a Board of Wardens for the Port of Philadelphia. This Board consisted of one Master Warden and six assistant wardens, four of whom were inhabitants of the city of Philadelphia, one of the Northern Liberties and one of the district of Southwark, to be yearly appointed by the Governor of the Commonwealth.

The Master Warden was required to attend daily at the office. The Board was required to meet at least once a month for the transaction of business. The Board was given full power and authority to grant licenses to persons to act as pilots in the Bay and River Delaware, and to make rules for the government of pilots; to decide all differences which might arise between masters, owners and consignees of ships or vessels and pilots; to direct the mooring of ships and vessels in the harbor and the order in which they shall lay, load or unload at the wharves and to make, ordain and publish such rules and regulations and with such penalties for the breach thereof, as they shall seem fitting and proper: *Provided*, That this shall not be contrary to the Constitution and Laws of the United States or of the Commonwealth.

The Master Warden and clerk was compensated by salary. The law provided that if the moneys paid into the hands of the Master Warden were insufficient to pay the expenses incurred in conducting the business, the Governor may draw a warrant upon the State Treasurer for the amount of such deficiency.

No person was permitted to erect a wharf or building beyond low water mark of the River Delaware without a license.

A penalty was established for obstructing a passage over wharves, but this regulation was not to prevent the depositing during reasonable times on any wharf, any goods, wares and merchandise unladen from or about to be shipped on board of any vessel or ship; or for the purpose of being stored,—always allowing a sufficient passage-way for cars, wagons and drays. This did not prevent any person from erecting or enclosing any part of the wharf lying landward of the low water mark or tideway of the River Delaware.

The Governor was required to appoint and commission a person of skill to be Harbor Master of the Port of Philadelphia. His duty was to enforce and superintend the execution of all of the Laws of the Commonwealth, and of all by-laws and rules and regulations of the city or of the Wardens of the Port of Philadelphia. He was authorized to appoint deputies to assist him and in full compensation for his services, he was entitled to recover and receive from the master, captain, owner or consignee of every ship or vessel arriving at the Port, the sum of one dollar.

2.—*The Appropriation of 1889 for Harbor Improvements.*

Whereas, The Congress of the United States, recognizing the importance of the preservation and permanent improvement of the harbor of the Port of Philadelphia, appropriated for the beginning of the work in 1888, the sum of \$500,000 upon the condition that the title to the lands of certain islands necessary to be removed, should be acquired and vested in the United States without charge to the National Government beyond the sum of \$300,000, and it appearing that this sum was insufficient to procure and vest title as aforesaid;

And whereas, The improvement of the harbor of the Port of Philadelphia is of essential importance to the people of the entire Commonwealth; therefore,

It is enacted by Act No. 330, approved by the Governor May 31st, 1889, That the sum of \$200,000, be specifically appropriated for the purpose of aiding in the acquisition of and vesting in the United States the title to Smith's Island, Windmill Island and such other islands, or parts thereof, as may be necessary to be removed in connection with the improvement of the Port of Philadelphia by the Government of the United States.

3.—*The Appropriation of 1905 for Deepening the River.*

Act No. 243, approved by the Governor on May 8, 1905, made an appropriation of \$375,000 for the deepening and improving of the channel of the Delaware River, between the city of Philadelphia and Delaware Bay.

At that time the Government of the United States was engaged in the work of deepening the said channel. To assist in the prosecution of the work, the Pennsylvania General Assembly appropriated the \$375,000 aforesaid, to be paid into the treasury of the City of Philadelphia, and to be expended in the said work under the supervision of the Department of Public Works, Bureau of Surveys, of said city, in accordance with the plan thereof, subject to the approval of the War Department; *Provided*, That the said City of Philadelphia shall appropriate a like amount for the purposes aforesaid.

4.—*The Laws of 1907 Relative to Harbor Master and Wharves, Docks and Ferries.*

(a) There were many amendments and supplements to the Law of 1803, and finally Act No. 323, approved June 8th, 1907, abolished the Board of Wardens for the Port of Philadelphia and the offices of Harbor Master and Master Warden of the Port of Philadelphia, and transferred the property belonging to these officials to the Board of Commissioners of Navigation for the River Delaware and its Navigable Tributaries.

(b) Act No. 322, approved June 8, 1907, established a Board of Commissioners of Navigation for the River Delaware and its Navigable Tributaries; regulated their jurisdiction over ships, vessels and boats, and wharves, piers, bulk-heads, docks, slips and basins; exempted Philadelphia from certain of these provisions and made an appropriation therefor.

The said Board of Commissioners of Navigation consists of five members—one of whom shall be the Director of the Department of Wharves, Docks and Ferries for the City of Philadelphia, who shall be President thereof; one of whom shall be appointed by the Mayor of Philadelphia, and one by the Mayor of Chester, from such commercial bodies as the councils of said cities may designate; one of whom shall be elected by the council of the city of Chester, and one of whom shall be elected by the Burgess and Council of the Borough of Bristol.

The Commissioners are empowered to employ necessary help and make rules for regulating, stationing and anchoring ships, vessels and boats in the River Delaware and its navigable tributaries or at the wharves, piers or bulk heads, or in the docks, slips or basins, extending into or on the river and its navigable tributaries; for removing from time to time, ships, vessels and boats, in order to accommodate and make room for others, or for admitting river craft to pass in and out of the docks, slips and basins, and for compelling the masters and captains of ships, vessels and boats to accommodate each other, so that ships, vessels, and boats shall, for a reasonable time, be entitled to berths next to the wharves, piers, and bulk-heads, until they have landed or loaded their cargoes.

The Commissioners have power to survey and make soundings to ascertain the capacities of the aforesaid river and its navigable tributaries, and to prepare plans and to keep records thereof. They may regulate, fix and establish bulk-head and pier-head lines, and the distance between piers, subject to the regulation of the United States Government; to adopt and promulgate rules and regulations for the construction, extension, alteration, improvement, and repair of wharves, piers, bulkheads, docks, slips, and basins; but for territory outside of the City of Philadelphia only.

It is the duty of the President of the Commission to enforce the laws of the Commonwealth and the rules and regulations promulgated by the said Commission pertaining to the above mentioned matters; but the Commissioners shall not have jurisdiction within the City of Philadelphia for the purpose mentioned in the preceding paragraph.

Whenever any person shall desire to construct, extend or alter any wharf or pier, or to erect, extend, alter, or improve any other harbor structure into or on the aforesaid river and its navigable tributaries, such person shall make application in writing and file in the office of the President of the Commission the plans and specifications thereof: Wherefore a hearing, duly advertised, shall be given, and when approved, a license shall be issued for the erection, construction, extension, alteration, or improvement for which application was made: *Provided*, This jurisdiction shall not apply to the City of Philadelphia territory.

Whenever the owner or lessee of any wharf, pier or bulkhead shall fail to keep and maintain the adjoining dock cleaned and free from obstructions, the President of the Commission, upon default for 30 days after the service of notice, may clean and free said dock from obstructions and apportion the expense and collect the cost by filing liens therefor, in the name of the Commonwealth of Pennsylvania: *Provided*, That the Commissioners shall not have such jurisdiction within the City of Philadelphia.

The Board of Commissioners may regulate the services and fix the maximum rates for wharfage, crantage and dockage; but only outside of the city of Philadelphia.

If any person or persons whomsoever, shall cast or place or leave in position where the same may be washed or drifted into the tide-way of the River Delaware, or into the River Schuylkill from the lower falls thereof to its junction with the River Delaware, any ballast, cinders, ashes, dirt, refuse, or any heavy article

whatever, he or they so offending, for any offense, shall pay a sum not exceeding one hundred dollars, to be sued for and recovered, with the costs of suit, for the use of the Commonwealth.

Upon information of the sinking of any canal-boat, barge, or other vessel, in the channel-way of the tide-waters of the River Delaware or its navigable tributaries, or in any of the docks thereof, the President of the Commissioners shall give notice to the owner, master or other agent having charge thereof, to raise and remove such obstruction within ten days under penalty of one hundred dollars, to and for the use of the Commonwealth of Pennsylvania; and in case of refusal or neglect of the parties interested, as aforesaid, to raise and remove any such obstruction, it is the duty of said President to have it raised and removed at the expense of the owner, etc.; and the boat, barge or other vessel, together with the cargo thereof, shall be subject to a lien, and the President may sell at public auction for cash all such property or so much thereof as is necessary to pay all expenses incurred. Should the sum realized from the sale be insufficient, the President may sue for the amount of such deficiency in the name of and for the benefit of the Commonwealth; and it is the duty of the Attorney General of the Commonwealth to institute and prosecute such suits.

The Commissioners make an annual report to the Governor of the State.

The General Assembly transferred \$53,324, appropriated in the general appropriation bill to the harbor offices and Port Warden at Philadelphia, to the said Board of Commissioners of Navigation, in addition to its receipts, for necessary expenses in the performance of its duties.

(c) Act No. 317, approved June 8, 1907, vests the authority over the pilots and pilotages in the Bay and River Delaware in the Board of Commissioners of Navigation.

(d) The growing commerce of Pennsylvania, and the substantial improvement being made by the government of the United States in the channel-ways of the rivers and harbors, made it desirable in 1907 for the City of Philadelphia to have enlarged and extended powers for the construction and development of wharves, docks and harbors.

Act No. 321, approved June 8th, 1907, established a Department of Wharves, Docks and Ferries, which shall be under the charge of a Director. He is appointed by the Mayor for a term of 4 years.

The Director appoints one deputy director, a secretary, as many dock masters and such other officers, clerks and employees as may be necessary; and shall fix the compensation and prescribe the duties of all persons appointed by him. At least one of the dock masters must be a competent civil engineer, one a master mariner and one a licensed pilot.

The Director has power to make surveys and soundings and plans; to regulate, fix and establish bulkheads and pierhead lines, and the distance between piers, subject to the regulations of the United States government; to adopt and promulgate rules and regulations for the construction, extension, alteration, improvement and repair of wharves, piers, bulkheads, docks, slips and basins within the limits of Philadelphia; and to make such recommendations to councils as to him shall seem proper for the improvement and development of the water-front of said city.

The Director has charge, control and supervision of all the wharves, piers, bulkheads, docks, slips, basins, structures thereon and storage property belonging to the city, including water fronts, lands under the water and structures thereon,

etc.; and of the repairing, building, rebuilding, maintaining, altering, strengthening and protecting said property, and every part thereof; and of all cleaning, dredging and deepening in and about the same.

The Director has authority to acquire by purchase such unimproved marsh lands, within the city, as may be reclaimable between the low-water line and the high-water shore line of the rivers, bays, lakes and navigable waters, and to reclaim, fill in and improve said marsh lands and construct thereon wharves, piers, docks, slips, basins and storage facilities; and may lease or sell such part or parts of said lands as cannot be so improved.

The Director may acquire, by purchase, such wharves, piers, bulkheads, docks, slips, basins and storage facilities appurtenant thereto, lands, property, rights, easements and privileges, within the limits of Philadelphia, as may be required for the purposes of commerce and navigation; and he may erect on such lands, piers and bulkheads, such structures and buildings as may be necessary for the proper and convenient use of such wharves, piers and bulkheads, for the storage of incoming or outgoing goods, wares, or merchandise; and he has the power to make all rules necessary for the government of such storage facilities and fix all rates and charges for their use and occupation.

Whenever any person shall desire to construct, extend, or alter any wharf, etc., he shall make written application to the Director, accompanied with plans and specifications, and after having duly advertised, the Director may approve the plans and issue a license for the erection, construction, extension, alteration, or improvement.

The Director is charged to keep and maintain the docks cleaned and free from obstruction under substantially the same condition provided by the Board of Commissioners of Navigation for the work beyond the city limits.

The Director was authorized to regulate the services and fix maximum rates and charges for ferriage, to be imposed and collected by all companies and individuals operating ferries wholly within the limits of the city; and to regulate the services and fix maximum rates for wharfage, crantage and dockage, whether the service is performed by the owners of said wharves, piers and docks, or by the said city, under the provisions of Sections 13 and 14 of said Act of 1907.

Whenever the Director shall deem it expedient to erect, construct, extend, alter or improve any public wharf, pier or bulkhead, and in connection therewith it shall become necessary to acquire lands, leaseholds, easements and other property rights adjoining such wharf, pier or bulkhead, for which no price can be agreed upon, the Director may enter upon and occupy such property; and a jury of viewers may be appointed to assess damages.

The Director may lease for a period not to exceed 10 years, storage facilities, wharves, piers, bulkheads, docks, slips, and basins belonging to the city.

The councils of the city are enjoined to appropriate annually the funds necessary for the maintenance and operation of the said Department of Docks, Wharves and Ferries.

5.—The Appropriation of 1907, for Port Improvements.

Act No. 664, approved by the Governor on June 13th, 1907, appropriated \$250,000 to the city of Philadelphia, upon the condition that said city appropriate a like or greater sum, for the improvement of her water-front and dockage system, and the reclaiming of waste lands.

6.—*The Appropriation of 1911.*

An appropriation act of the General Assembly of 1911, approved June 15, 1911, specifically appropriated to the Department of Wharves, Docks and Ferries of Philadelphia, the sum of \$450,000 for dredging in the Delaware and Schuylkill rivers, within the State; for the improvement of harbor facilities, dockage systems, reclaiming waste land; the purchase or condemnation of waste land, or lands that are practically waste; the purchase of desirable sites upon which to erect piers, and for the construction of piers, bulkheads, or other harbor improvements; for the dredging of docks and for the removal of shoals in the Delaware River, between the channel and the pierhead line, and the pierhead and bulkhead lines, along the Delaware and Schuylkill rivers within the limits of the State of Pennsylvania.

7.—*The Laws and Appropriations of 1913, Relative to Port Improvements.*

(a) Act No. 750, approved July 25, 1913, appropriated the sum of \$250,000 to the Department of Wharves, Docks and Ferries of Philadelphia, for purposes similar to the 1911 appropriation. The law provides as follows:

"The moneys so appropriated shall only be expended as authorized and directed by the councils of the City of Philadelphia. A competent engineer shall be appointed by the Governor, for a term of four years at a salary of \$4,000 per year, payable out of said appropriation. Said engineer shall assist and co-operate in the said work with the director of the Department of Wharves, Docks and Ferries of the city, and report to the Governor from time to time as to the expenditure of said moneys. No such moneys shall be drawn out of the State Treasury except upon warrants drawn by the Auditor General, upon requisition by the Director of the Department of Wharves, Docks and Ferries of said city."

(b) Act No. 436 approved July 22nd, 1913, contemplates the Commonwealth's appropriation for building retaining structures adjoining the banks of navigable streams in Philadelphia for the purpose of protecting the channel of such streams.

The law reads as follows:

"Section 1. Be it enacted, &c., That the directors of the Department of Wharves, Docks and Ferries, in any city of the first class, shall have authority, after the appropriation by councils, of said city, or by the Commonwealth of Pennsylvania, of the money required therefor, to erect and construct retaining structures adjoining the banks of navigable streams located within its corporate limits, for the purpose of protecting the channel of such streams; and when any such retaining structures shall have been erected or constructed the cost thereof per foot shall be filed in the office of said Director, and no riparian owner, lessee or licensee, shall use any such retaining structure for the purpose of constructing, extending, altering, improving or repairing any wharf, or other building in the nature of a wharf, or other harbor structure, or for other wharf purposes, without having previously paid to the said director of the city in which such retaining structure is erected or constructed the cost of erecting so much of said retaining structure as is so used; and any such person who shall use any such retaining structure as aforesaid, before the cost thereof has been paid to the said city a penalty of twenty-five dollars per day for every day on which such retaining structure shall be so used, to be collected as debts of a similar nature are now collected. All money paid to the director under the provisions of this act shall be paid by him into the city treasury, to be used by the said city only for the purpose of developing, extending and improving the wharves owned by the said city."

(c) Act No. 460, approved July 24, 1913, provides that in addition to the existing powers in respect to public wharves, the municipalities of this Commonwealth shall have power to erect and maintain market-houses and terminal sheds or stations on said wharves, for the receipt and distribution of freight, express,

and other matter hauled by boats, railroads and street cars. Said power includes the right to construct railroad and street car tracks or other facilities on said wharves to provide for the convenient handling of such freight or express matter, and the right to collect rents, tolls or charges for the use of such market-houses, terminal stations, tracks and other facilities.

(d) The General Assembly of 1913, adopted a joint resolution proposing an amendment to Section 8, article 9 of the Constitution of the Commonwealth of Pennsylvania, which will come before the General Assembly of 1915, and if these passed, then go to the people for ratification. Section 8 as so amended will read:

"The debt of any county, city, borough, township, school district, or other municipality or incorporated district, except as herein provided, shall never exceed seven per centum upon the assessed value of the taxable property therein, nor shall any such municipality or district incur any new debt, or increase its indebtedness to an amount exceeding two per centum upon such assessed valuation of property, without the assent of the electors thereof at a public election in such manner as shall be provided by law; but any city, the debt of which now exceeds seven per centum of such assessed valuation, may be authorized by law to increase the same three per centum in the aggregate, at any one time, upon such valuation; except that any debt or debts hereinafter incurred by the city and county of Philadelphia for the construction and development of wharves and docks, or the reclamation of land to be used in the construction of a system of wharves and docks, as public improvements, owned or to be owned by said city and county of Philadelphia, and which shall yield to the city and county of Philadelphia current net revenue in excess of the interest on said debt or debts and of the annual installments necessary for the cancellation of said debts or debt, may be excluded in ascertaining the power of the city and county of Philadelphia to become otherwise indebted: *Provided*, That such indebtedness incurred by the city and county of Philadelphia shall not at any time, in the aggregate, exceed the sum of \$25,000,000. for the purpose of improving and developing the port of the said city and county, by condemnation, purchase, or reclamation or lease of land on the banks of the Delaware or Schuylkill rivers and land adjacent thereto; the building of bulkheads, and the purchase or construction or lease of wharves, docks, sheds and warehouses and other buildings and facilities necessary for the establishment and maintenance of railroad and shipping terminals along the said rivers; and the dredging of the said rivers and docks: *Provided*, That the said city and county shall, at or before the time of so doing, provide for the collection of an annual tax sufficient to pay the interest thereon, and also the principal thereof within fifty years from the incurring thereof."

8.—*Summary of State Appropriations for Navigation and Harbor improvements.*

By a decree of the Supreme Court of the United States the Harbor Master and Port Warden of the Port of Philadelphia were prohibited from collecting fees, as heretofore, from vessels entering said port, which fees paid the salaries of said officers, therefore, by Act No. 957, approved April 15th, 1869, these officers each received \$2,500 annually, to be paid out of the State treasury beginning January 1st, 1869.

Eight years after the above provisions for salaries, the duties of Harbor Master having greatly increased, it became necessary to have deputies to assist him in the performance of his duties, to promote the commercial interests of Philadelphia; therefore, Act No. 6, approved March 22nd, 1877, appropriated \$3,000 for such additional expenses for one year. In the following tabular statement appears the State appropriations for the conducting of the work of the Harbor Master and Port Warden for the year 1877 to 1905, inclusive, when their respective duties were taken over by the Board of Commissioners of Navigation, as hereinbefore explained. The subsequent State appropriations went to the said Commissioners of Navigation.

STATE APPROPRIATIONS FOR THE REGULATION OF NAVIGATION
AND THE IMPROVEMENT OF HARBOR FACILITIES IN THE PORT OF
PHILADELPHIA.

Year.	For Operating Expenses.	For Construction Expenses.
1877,	\$3,000	.....
1878,	4,000	.....
1879,	9,000	.....
1881,	15,000	.....
1883,	10,000	.....
1885,	22,000	.....
1887,	23,000	.....
1889,	22,000	\$200,000
1891,	23,000	.....
1893,	25,500	.....
1895,	28,000	.....
1897,	28,000	.....
1899,	28,700	.....
1901,	53,900	.....
1903,	65,000	.....
1905,	52,464	375,000
1907,	53,324	250,000
1909,	63,000	.....
1911,	63,000	450,000
1913,	63,000	250,000
		\$1,525,000

9.—*The Health Law of 1818.*

The State of Pennsylvania has from the earliest time exercised supervision over and provided officers and made liberal appropriations to protect the public health at the Port of Philadelphia. In 1818, the Senate and House of Representatives of the State established a health office to secure the city and Port of Philadelphia against contagious diseases. A Board of Health was created to serve without compensation, and vested with authority to make general rules and regulations for the government of the Lazaretto and the vessels, cargo and persons there detained or under quarantine, and for the government of public hospitals. The Governor was required to appoint a Lazaretto physician, and a Port Physician, one health officer and one quarantine master, all of whom shall be under the direction and control of the Board. It was the duty of the Board to abate nuisances in the streets and alleys and along the wharves and docks or in any other part of the city of Philadelphia, the district of Southwark, and the townships of the Northern Liberties, Moyamensing and Penn. The officers were to receive a salary and for defraying the expenses incurred under the provisions of the act, the Board was authorized to levy and collect by tax at the same rates and under the same regulations as the county rates are or may be levied and collected, such sums annually as shall be deemed necessary.

10.—*The Health Law of 1893.*

Under date of February 15, 1893, the Congress of the United States enacted a general quarantine law, to be administered by Federal officers stationed in foreign countries and by the Federal Marine Hospital service acting as quarantine officers at stations on or near the navigable waters of United States. There was reason to believe that the Federal quarantine for the Delaware Bay and River would be fully equipped and in effective operation during the summer of 1893; and, whereas,

the multiplication of quarantine visits and inspections on board ship during one and the same entry into the port of Philadelphia would interfere with the expeditious movement of maritime commerce, by Act of General Assembly No. 257, approved June 5, 1893, the Governor of Pennsylvania was authorized to suspend operations of State quarantine as provided in the Act of 1818, and its supplements and other quarantine laws of the State, and to establish a new quarantine station at some suitable place on the waters of the Delaware River, and to abandon the present Lazaretto and turn the same over to the city of Philadelphia.

Said law of 1893 established a State Quarantine Board of the Port of Philadelphia. The Board was constituted as follows: The President of the College of Physicians of Philadelphia, the Secretary of the State Board of Health, the President of the Philadelphia Maritime Exchange, the Health Officer of the Board, the Quarantine Physician of the Board, a member to be appointed by the Mayor of Philadelphia and a member to be appointed by the Governor of Pennsylvania, making seven in all.

The Board may make such rules and regulations not inconsistent with the laws of United States and of Pennsylvania as necessary for the government and management of the quarantine station and for the detention of vessels, their crews and passengers, the disinfection of vessels and their crews, passengers, baggage and cargo.

The Governor is required to appoint one physician who shall be denominated the Quarantine Physician. He is a member of the Board and the executive officer of the quarantine station. His duty is to enforce all laws, rules and regulations as may be provided by the Board and his salary and that of his deputies shall be paid by the State.

The Health Officer appointed in pursuance of Act 1818, shall establish a public office at or within three squares of the custom House in Philadelphia, to be known as the Quarantine Office to be open throughout the year from 9 A. M. until 5 P. M., Sundays and holidays excepted, whereat all masters and captains of vessels may deliver the health certificate required by law. All fees collected by him shall be paid over monthly to the State. He also receives a salary paid by the State.

When the Quarantine Physician shall be satisfied that all vessels coming from any port or place outside the Commonwealth may be admitted into the port without danger to the health of the people of the Commonwealth, he shall give a certificate permitting the vessel to proceed, which certificate the captain or master shall present at the quarantine office in the city.

Whenever the State quarantine service is suspended by the Governor, the master of every vessel arriving from a port without this Commonwealth, excepting ports on the Delaware River above Reedy Island, shall appear at the quarantine office in Philadelphia, and show that a certificate of health has been granted to him by the officers in charge of the Federal Quarantine Station and that the same has been deposited with the collector of the port. If it shall appear that any contagious or infectious disease has developed on any vessel after her release from the Federal Quarantine, the Quarantine Physician may order such vessel back to said Federal Quarantine Station for further inspection and treatment.

The expense and charge of boarding, lodging, medicines, nursing and maintenance, and other necessities provided for the persons landed and sent to the said State Quarantine Station, and all other expenses, salaries or wages, incident to the maintenance of said quarantine station, and of the persons detained there, and of the tug boats, and of the said quarantine office in the city of Philadelphia, and of the office of the State Quarantine Board shall be paid by the Commonwealth.

From and after July 1st, 1893, the offices of Lazaretto Physician and Quarantine Master ceased to exist.

Port of Philadelphia for the purpose of the act creating the State Quarantine Board includes all the counties that abut upon the navigable waters of the Delaware River and the navigable tributaries thereof within Pennsylvania.

11.—*State Appropriations for Quarantine Board.*

In 1891, a Commission was appointed to select a site for the proposed new State Quarantine Station and an appropriation of \$1,000 was provided therefor by the General Assembly. The State appropriations for the maintenance of the State Quarantine Board and for the work of the Quarantine Physician and Health Officer for the years 1893 to 1913, inclusive, are shown in the following tabular statement:

APPROPRIATIONS MADE BY THE GENERAL ASSEMBLY AND APPROVED BY THE GOVERNOR OF PENNSYLVANIA FOR THE STATE QUARANTINE BOARD OF THE PORT OF PHILADELPHIA.

Year.	Amount.
1891,	\$1,000 00
1893,	59,400 00
1895,	64,200 00
1897,	99,200 00
1899,	79,200 00
1901,	144,616 60
1903,	108,200 00
1905,	80,040 00
1907,	75,540 00
1909,	80,540 00
1911,	94,640 00
1913,	96,040 00

12.—*The Pennsylvania Nautical School Appropriations.*

The Pennsylvania Nautical School was established by Act of April 17th, 1889. It was governed by a board of six directors, three of whom were appointed by the Governor of the State, and three by the Mayor of the City of Philadelphia.

The Board of Directors was authorized and directed to provide and maintain a nautical school for the education and training of pupils in the science and practice of navigation; to furnish accommodation on board a proper vessel for said school and make all needful rules and regulations therefor, and to prescribe the government and discipline therefor, and the terms and conditions upon which pupils shall be received and instructed therein and discharged therefrom, and provide in all things for the good management of said nautical school.

The Board had the power to purchase the books and apparatus, stationery and other necessary or expedient to enable said school to be properly and successfully conducted, and to cause the said school, or the pupils or part of the pupils thereof, to go on land or vessel or vessels in the harbor of Philadelphia, and take cruises in or from said harbor for the purpose of obtaining a practical knowledge in navigation and the duties of mariners.

The Board was authorized to receive from the United States Government such vessel or vessels as the Secretary of the Navy may detail for the use of the school.

The first vessel detailed by the Secretary of the Navy upon the application of the Governor of the State of Pennsylvania was the U. S. sloop of war Saratoga, which was recently withdrawn as unfit for further employment, after 18 years of usefulness. The second to be designated was the U. S. Cruiser Adams which has undergone alterations and been made suitable for schoolship purposes.

The city of Philadelphia appropriated annually between \$15,000 and \$20,000. The State of Pennsylvania appropriated between \$10,000 and \$15,000 per annum.

APPROPRIATIONS MADE BY THE STATE AND THOSE MADE BY THE CITY OF PHILADELPHIA FOR THE PENNSYLVANIA NAUTICAL SCHOOL OF PHILADELPHIA.

Year.	State For 2 Year Period.	City For Same Period.
1889,	\$20,000	\$30,000
1891,	26,000	40,000
1893,	26,000	40,000
1895,	24,000	37,000
1897,	24,000	37,000
1899,	24,000	40,000
1901,	24,000	40,000
1903,	24,000	40,000
1905,	24,000	40,000
1907,	24,000	40,000
1909,	24,000	40,000
1911,	30,000	30,000
1913,		

The school automatically ceased to exist in 1913, for lack of appropriations by the city and by the State.

13.—*Summary of all State Appropriations for or in Connection with the Port of Philadelphia.*

STATE APPROPRIATIONS.

Year.	Navigation and Im- provement of Harbor Facilities.		State Quarantine Board of the Port of Philadelphia.	Pennsylvania Nautical School of Pennsylvania.	Total.
	For Operating Expenses.	For Construction Expenses.			
1877,	\$3,000				\$3,000
1878,	4,000				4,000
1879,	9,000				9,000
1881,	15,000				15,000
1883,	10,000				10,000
1885,	22,000				22,000
1887,	23,000				23,000
1889,	22,000	\$200,000			242,000
1891,	23,000		\$1,000	26,000	50,000
1893,	25,500		59,400	26,000	110,900
1895,	28,000		64,200	24,000	116,200
1897,	28,000		99,200	24,000	151,200
1899,	28,700		79,200	24,000	131,900
1901,	53,900		144,616	24,000	222,516
1903,	65,000		108,200	24,000	197,200
1905,	52,464	375,000	80,040	24,000	531,504
1907,	53,224	250,000	75,540	24,000	402,864
1911,	63,000	450,000	94,640	30,000	637,640
1913,	63,000	250,000	96,040		409,040
	\$654,888	\$1,525,000	\$982,616	\$294,000	\$3,456,504

FEDERAL IMPROVEMENT OF RIVERS AND HARBORS IN THE PHILADELPHIA DISTRICT AND APPROPRIATIONS THEREFOR.

The Federal improvement of rivers and harbors in the Philadelphia district is divided, for purposes of this report, into four projects, namely:

- 1—Delaware River—Philadelphia to the Sea,
- 2—Philadelphia Harbor Improvement,
- 3—Delaware River—Philadelphia to Trenton,
- 4—Harbor of Refuge—Delaware Bay.

1.—*Delaware River, Philadelphia to the Sea.*

The Delaware River has its source in Delaware County, New York State, is about 315 miles long, flows in a general southerly direction, and empties into Delaware Bay.

Trenton is the actual and natural head of navigation for vessels and other craft. Tide water extends as far as Trenton and the mean range of tide at this point is 4.2 feet. The river is navigable for rafting and logging for a distance of about 214 miles above Trenton.

Philadelphia is 30 miles below Trenton and 55 miles above the mouth of the river. The distance by water from Philadelphia Harbor to the harbor of refuge, Delaware Bay, is about 101 miles. The draft that can be carried from the ocean through Delaware Bay (50 miles) to the mouth of the river is 30 feet at mean low-water. The accepted point of division between Delaware Bay and River is at Liston Point, in the Bay about 8 miles below the mouth of the river. From the Point to the ocean the minimum usable low-water depth is 40 feet.

Originally the obstruction reduced the depth of the river channel so that it was available for ocean-going vessels of medium draft only.

Prior to 1885, so the U. S. Engineers Reports show, the dredging was done under appropriations for special localities.

The first permanent and systematic improvement of the river between Philadelphia and the Sea, was commenced in 1885. This was the 26 foot deep channel project, width 600 feet from near Allegheny Avenue, Philadelphia, to deep water in Delaware Bay.

The second project was adopted in March, 1899. It provided for a channel 30 feet deep at mean low water, width of 600 feet from Christian Street to the Bay. This work was completed March, 1911.

The existing project for the improvement of this section of the river, was adopted June, 1910. It provides for a channel 35 feet deep at mean low water, 800 feet wide in the straight parts, 1,200 feet wide at Bulkhead Bar and 1,000 feet wide at other bends, and for the construction of dykes to control the tidal flow. The estimated cost is \$11,000,000 in round numbers and an annual cost of \$300,000 for maintenance.

"The maximum draft that could be carried on June 30, 1914, over the shoalest part of the portion of the river embraced in this improvement was 30 feet at mean low water. The mean range of tide varies from 5.3 feet at Philadelphia to 6 feet at deep water at the head of Delaware Bay. A channel of the depth and width specified in the adopted project has been completed, or the work is nearing completion, from Greenwich Point, at the lower end of Philadelphia Harbor, to a point a little above Wilmington, Del., a distance of about 19.9 miles."

The amount expended under all previous projects for improving the river below Philadelphia, from 1836, to the time of taking up the existing project, excluding, of course, the sum expended in the improvement of Philadelphia Harbor, is stated by the Federal engineers to have been \$10,176,002.08.

The appropriations were substantially as follows:

Appropriations—Delaware River.

Total from 1836 to Dec. 31, 1902,	\$4,204,000 00	
March 3, 1903,	1,400,000 00	
April 28, 1904,	1,000,000 00	
March 30, 1905,	500,000 00	
June 30, 1906,	1,000,000 00	
March 2, 1907,	895,000 00	
May 27, 1908,	375,000 00	
March 3, 1909 (allotment March 17, 1909),	390,000 00	
March 4, 1909,	125,000 00	
		<hr/> \$9,889,000 00
June 25, 1910,	\$800,000 00	
Feb. 29, 1911,	800,000 00	
July 25, 1912,	1,300,000 00	
Aug. 24, 1912,	450,000 00	
March 4, 1913,	1,750,000 00	
June 23, 1913,	250,000 00	
Miscellaneous up to June 30, 1913,	28,864 51	
		<hr/> 5,378,864 51
		<hr/> \$15,267,864 51
		<hr/> <hr/>

2.—*Philadelphia Harbor Improvement.*

A project for the improvement of Philadelphia Harbor adopted Aug. 11, 1888, was completed Jan. 10, 1898, the resulting channel having a least depth of 26 feet at mean low water, except at one locality just below Cramp's Ship-yard, over which the depth was slightly less than 26 feet, with a width varying from 1,015 to 1,850 feet, extending from a point opposite Morris Street, Philadelphia, to the Pennsylvania Railroad bridge, a distance of 6.2 miles.

The total amount expended in this improvement, including survey of the locality and the acquisition of land, was reported as \$3,945,424.75.

Appropriations.

Total to Dec. 31, 1902,	\$3,940,000 00
Allotment 1905,	10,000 00
	<hr/>
	\$3,950,000 00
	<hr/> <hr/>

3.—*Delaware River—Philadelphia to Trenton.*

Prior to 1910, on comprehensive project had even been adopted for the improvement of this part of the river. Work had been done at various times since 1872 at different localities, with a view to obtaining a depth of 7 feet at mean low

water and a width of 200 feet. Under the general project for improving Philadelphia Harbor, a channel 26 feet deep was dredged through Five-Mile Bar between 1888 and 1898.

The amount expended in the improvement of the Delaware River between Philadelphia and Trenton prior to the adoption of the existing project and exclusion of the sum expended in the harbor improvement was \$197,623.25.

The existing project for the improvement of this section of the river was adopted June 25, 1910, and provides for a channel 200 feet wide and 12 feet deep at mean low water, at an estimated cost of \$360,000 and an annual cost of \$20,000 for maintenance.

The work was substantially completed in May, 1913. The total amount expended in connection with the project up to June 30, 1914, was reported to be \$315,977.10. Therefore, the total amount expended on all projects pertaining to the Delaware River from Allegheny Avenue, Philadelphia to Trenton is as follows:

Prior to existing project,	\$197,623 25
Existing project to date,	315,977 10
	<hr/>
	\$513,600 35
	<hr/>

The completion of the channel has enabled sea-going vessels of medium draft to reach the manufacturing plants along the line of the improvement. It has enabled the regular line of steamers plying between Philadelphia and Trenton to make faster time, to run on schedule and to increase business.

The maximum draft that could be carried on June 30, 1914, over the shoalest part of the locality under improvement was 11 feet at mean low-water (opposite Mud Island).

Appropriations.

Total from 1836 to Dec. 31, 1902,.....	\$124,500 00
March 2, 1907 (Perriwig Bar),.....	50,000 00
March 2, 1907 (Allotments near Bordentown),.....	10,000 00
March 3, 1909 (Perriwig Bar),.....	1,500 00
March 3, 1909 (Sewer Shoal near Trenton),	15,000 00
June 25, 1910,	100,000 00
March 4, 1911,	160,000 00
August 24, 1912,	70,000 00
March 4, 1913,	20,000 00
	<hr/>
	\$551,000 00
Sales Receipts,	16 04
	<hr/>
	\$551,016 04
	<hr/>

4.—*Harbor of Refuge—Delaware Bay.*

The great value of this Harbor of Refuge, on the Delaware Bay, near the ocean is due to the fact that it is located about equal distance from New York, Philadelphia and the Chesapeake capes, and affords a haven of refuge, or a port of call for practically the entire shipping of the North Atlantic Coast. The harbor is largely used by vessels awaiting orders or charters.

It has a protected anchorage area of 552 acres, with a minimum low-water depth of 30 feet, and an additional area of 237 acres with a minimum low-water depth of 24 feet.

The work on the breakwater was commenced in 1897, and completed in 1901. The sub-structure of the breakwater has a length of 8,040 feet and the superstructure a length of 7,950 feet. The cost of constructing the breakwater and the ice piers forming the harbor of refuge was \$2,238,205.34.

Appropriations.

Total as per H. Doc. No. 423, 57th Congress,.....	\$2,239,334 00
June 25, 1910,	8,000 00
February 27, 1911,	8,000 00
	<hr/>
	\$2,255,334 00
	<hr/>

5.—*Summary of Federal Appropriations for Navigation and Harbor Improvement.*

The Federal appropriations up to June 30, 1914, may be summarized as follows:

Delaware River—Philadelphia to the Sea,	\$15,267,864 51
Philadelphia Harbor,	3,950,000 00
Delaware River—Philadelphia to Trenton,	551,016 04
Harbor of Refuge—Delaware Bay,	2,255,334 00
	<hr/>
Grand total,	\$22,024,214 55
	<hr/>

CITY APPROPRIATIONS FOR HARBOR AND PORT IMPROVEMENT.

1.—*Prior to 1907.*

The Department of Wharves, Docks and Ferries was created and established July 1st, 1907. Prior to that time and in fact from 1890 to 1907, the city of Philadelphia appropriated \$5,718,743 for harbor improvements as follows:

Port Wardens (Dredging, etc.),	\$217,053 00
City Property (Dredging, Repairs, Piers, etc.),	217,337 00
Bureau of Surveys:	
(Dredging Delaware River),	1,164,475 00
(Dredging Schuylkill River),	773,629 00
(Widening Delaware Ave.),	2,152,706 00
Bureau of City Ice Boats to 1907,	984,890 00
Removal of Smith and Windmill Island,.....	208,653 00
	<hr/>
Total,	\$5,718,743 00
	<hr/>

2—*Since 1907.*

In addition to general funds appropriated for operation, the following loan moneys have been appropriated by the city since July 1, 1907, for harbor improvements:

To the Department of Wharves, Docks and Ferries:

March 12, 1909, for reclamation of land and piers construction,.....	\$1,000,000 00
May 27, 1909, for bulkhead along Delaware Ave.,	10,000 00
July 19, 1909, for improvement of Delaware and Schuylkill Rivers,.....	400,000 00
July 29, 1910, for repairs to piers and city ice boats,.....	43,010 00
July 19, 1911, for Vine St. pier and new Dock St. pier,.....	600,000 00
June 4, 1912, for maintenance of boats,.....	7,000 00
May 1, 1913, for land for wharves, etc.,	1,600,000 00
June 22, 1914, for purchase of ground, and preliminary construction of pier at foot of McKean St., Delaware River,.....	500,000 00

Total to Dept. W., D. & F., \$4,160,010 00

To the Department of Public Works:

Feb. 9, 1907, for widening of Delaware River Ave.,.....	\$500,000 00
Feb. 25, 1913,	250,000 00
Dec. 31, 1913,	10,000 00
June 30, 1914, Funds available for carrying forward So. Philadelphia track elevation and terminal improvement work,	1,000,000 00
Total available to supply public works,	1,760,000 00
Total,	\$5,920,010 00

3.—*Summary of City Appropriations for Harbor and Port Improvements.*

Prior to 1907,	\$5,718,743 00
Since 1907,	5,920,010 00
Total,	\$11,638,753 00

GRAND SUMMARY OF FEDERAL, STATE AND CITY APPROPRIATIONS
FOR THE PORT.

Before 1890, moneys, appropriated by the city of Philadelphia for river improvement purposes, were infrequent and of small amount. The total appropriations on the part of the city for the improvement of the Port up to June 30, 1914, were approximately \$12,000,000. The additional sum appropriated by the State of \$1,525,000 for construction work, makes a grand total of \$13,525,000 which the city has had for the following undertakings, among others:

- a--Removal of Smith and Windmill islands (from the Delaware River between Philadelphia and Camden).
 b--Widening Delaware Avenue and incidental changes (including extending city piers to the pierhead line).
 c--Construction of new steamship piers.
 d--Construction and maintenance of city ice boats.
 e--Purchase and maintenance of municipal dredging plant.
 f--Dredging of river channels and their improvements.

EXPENDITURES AUTHORIZED BY APPROPRIATIONS OR ACTUALLY MADE BY THE FEDERAL, STATE AND CITY GOVERNMENTS FOR IMPROVING AND MAINTAINING AND IMPROVING THE HARBOR OF PHILADELPHIA AND DELAWARE RIVER TO THE SEA, UP TO JUNE 30TH, 1914.

Year.	Harbor of Philadelphia.			Delaware River.
	Federal construction and maintenance.	State construction.	City construction and maintenance.	Federal construction and maintenance.
1889,	\$200,000	.....	.....
1890,
1900,
1901,
1902,	*\$3,940,000	.....	.....	**\$4,204,000
1903,	1,400,000
1904,	1,000,000
1905,	10,000	275,000	.....	500,000
1906,	***\$5,718,743	1,000,000
1907,	250,000	500,000	895,000
1908,	375,000
1909,	1,410,000	515,000
1910,	43,010	800,000
1911,	450,000	600,000	800,000
1912,	7,000	1,750,000
1913,	250,000	1,860,000	2,028,865
1914,	1,500,000	.....
	\$3,950,000	\$1,525,000	\$11,638,753	\$15,267,865

* Total expenditures up to December 31, 1902.

** From 1836 up to December 31, 1902.

*** Total between 1890 and July 1, 1907.

Federal:

Harbor, \$3,950,000 00

River, 15,267,865 00

Total Federal, \$19,217,865 00

State, 1,525,000 00

City, 11,638,750 00

\$32,381,615 00

II. PRESENT CONDITIONS AND PROSPECTS OF THE PORT.

PORT BUSINESS.

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II. PRESENT CONDITIONS AND PROSPECTS OF THE PORT.

PORT BUSINESS.

1.—*Movement of Vessels, Tonnage and Values.*

The report of the United States Collector of the Port showed a decrease in value of foreign exports and imports and a corresponding shrinkage in the customs duties for the year 1913. The year 1912 recorded one of the largest movements in foreign trade in the port's history.

The following table compiled for The Public Service Commission, gives the comparative movement of vessels for three years:

ARRIVAL OF VESSELS DURING THE YEARS 1911, 1912 AND 1913 AT THE PORT OF PHILADELPHIA AS REPORTED BY THE COMMISSIONERS OF NAVIGATION.

Rig of Vessel.	1911		1912		1913	
	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.
From Foreign Ports.						
Steamships,	1,233	4,558,621	1,259	4,892,052	1,275	4,907,684
Ships,	4	7,167	1	1,675	.....	.....
Barks,	24	26,859	17	26,093	15	23,551
Brigs,	2	840	.....	.....	.....	.....
Schooners,	63	32,352	50	28,265	43	21,964
Barges, .....	.....	.....	5	15,350	3	23,154
Totals,	1,331	4,625,839	1,332	4,963,435	1,336	4,976,353
From Coastwise Ports.						
Steamships,	1,789	3,068,982	1,529	2,781,517	1,473	2,795,608
Ships,	4	10,208	3	9,579	2	5,329
Barks,	7	13,391	12	15,643	10	11,582
Schooners,	623	512,133	476	376,519	458	492,124
Barges,	2,532	1,986,835	2,307	1,864,447	2,629	2,077,393
Totals,	4,955	5,591,549	4,327	5,047,705	4,572	5,382,036
Totals.						
Foreign vessels,	1,331	4,625,839	1,332	4,963,435	1,336	4,976,353
Coastwise vessels,	4,995	5,591,549	4,327	5,047,705	4,572	5,382,036
Totals,	6,286	10,217,388	5,659	10,011,140	5,908	10,358,389

According to the report of the United States Engineer Department, the total tonnage movement of foreign, coastwise and river vessels during the year 1911 amounted to 25,786,180 tons of merchandise, carrying a money value of \$1,209,879,741; for 1912, the tonnage was 26,267,335 and the value \$1,235,106,621. For 1913, the tonnage was 26,445,058 and the value \$1,229,454,962. See table following:

AGGREGATE ANNUAL FREIGHT MOVEMENT ON THE DELAWARE RIVER FROM TRENTON, N. J., TO THE SEA.

(As reported by the United States Engineer Department.)

	1911		1912		1913	
	Quantity—Tons.	Value.	Quantity—Tons.	Value.	Quantity—Tons.	Value.
Foreign:						
Imports,	2,662,336	80,526,519	3,113,336	92,566,087	3,254,760	91,947,390
Exports,	2,945,686	70,869,648	2,853,436	72,769,617	2,685,004	72,236,967
Coastwise and domestic,	20,178,158	1,658,482,574	20,300,563	1,069,770,917	20,515,294	1,065,270,605
	(a)		(b)		(c)	
Totals,	25,786,180	1,209,879,741	26,267,335	1,235,106,621	26,445,058	1,229,454,962

(a)—Of this quantity about 4,984,635 tons were carried on car floats and lighters between Philadelphia and Camden.

(b)—Of this quantity about 4,685,234 tons were carried on car floats and lighters between Philadelphia and Camden.

(c)—Of this quantity about 4,535,130 tons were carried on car floats and lighters between Philadelphia and Camden.

Such an enormous business as this is worth taking care of. Director George W. Norris of the Department of Wharves, Docks, and Ferries, stated in his report for the year 1912 as follows:

“What the City of Philadelphia and the State of Pennsylvania have done in the past, and are doing at present, to encourage and improve this trade, however, could be told, unfortunately, in a few brief paragraphs.

“Without desiring to belittle in the slightest degree the earnest and long-continued efforts of the small band of public-spirited citizens who have worked consistently for many years for the advancement of the port, it can be said that the port's present business has, to a large extent, been forced upon it—in spite of itself, as it were—and represents comparatively little effort on the part of the City. What this business might have been with a tithe of the brain, spirit, and energy used in connection with it, which has been devoted to other lines of industrial up building in this city, is difficult to over-estimate.”

In this connection it may be well to look at the following table of annual value and tonnage of commerce on the Delaware River, compiled for The Public Service Commission. It will be noted that there has been but slight increase in value or tonnage during the last fifteen years.

ANNUAL VALUE AND TONNAGE OF COMMERCE, DELAWARE RIVER.

(Compiled from reports of The United States Engineer, Philadelphia Office.)

Calendar year.	Tonnage—Short tons.	Value.	Remarks.
1890,.....	12,250,000	\$295,000,000	Total tonnage and total value given include the entire river, bay and coastwise traffic as well as local movement of barges, lighters and car floats.
1891,.....	13,250,000	300,000,000	
1892,.....	14,400,000	300,000,000	
1893,.....	13,500,000	250,000,000	
1894,.....	18,350,000	350,000,000	
1895,.....	17,400,000	500,000,000	
1896,.....	15,300,000	565,000,000	
1897,.....	18,000,000	565,000,000	
1898,.....	18,400,000	750,000,000	
1899,.....	22,000,000	1,250,000,000	
1900,.....	24,000,000	1,550,000,000	
1901,.....	23,900,000	1,250,000,000	
1902,.....	22,000,000	1,650,000,000	
1903,.....	22,827,926	1,289,965,688	
1904,.....	23,372,036	1,579,060,906	
1905,.....	24,383,571	1,612,847,499	
1906,.....	26,111,047	1,472,540,364	
1907,.....	27,283,529	1,538,385,389	
1908,.....	24,023,895	1,249,175,518	
1909,.....	24,677,671	1,327,869,862	
1910,.....	25,496,213	1,340,391,894	
1911,.....	25,786,180	1,269,879,741	
1912,.....	26,267,335	1,235,106,621	
1913,.....	26,455,058	1,219,454,962	

2.—*Freight Rates.*

At present Philadelphia enjoys on its railroad freight traffic to interior points, slightly lower railroad rates than are given in New York.

FREIGHT CHARGES PER 100 LBS.

To Chicago From—	All Rail: Classes.						Lake and Rail: Classes.					
	1.	2.	3.	4.	5.	6.	1.	2.	3.	4.	5.	6.
	c	c	c	c	c	c	c	c	c	c	c	c
Boston,.....	70	61	47	33	28	23½	57	50	38	27	23	20
New York,	75	65	50	35	30	25	62	54	41	30	25	21
Philadelphia,	69	59	48	33	28	23	56	48	39	28	23	19
Baltimore,	67	57	47	32	27	22	54	46	38	27	22	18

Quoting further from Director Norris' report:

"The Port of Philadelphia is the natural and the economic outlet for oversea transportation of the products of Pennsylvania's multifarious industries. Inasmuch as industrial development is measured by the success with which trade can be maintained, it is self-evident truth that the State owes it to itself to give to these industries the most efficient and economic facilities for commerce in the Port."

3.—*Economic Development of Pennsylvania.*

a—Total Production.

The tonnage of the port is not increasing at a rate commensurate with the Economic Development of Pennsylvania.

The production of wealth in the State increased more rapidly during the decade ending 1910 than during any previous year.

TOTAL PRODUCTION OF WEALTH IN PENNSYLVANIA.

Year.	Value added by manufacture.	Value of products of mines and quarries.	Value of all farm products.	Total.
1860,	\$136,643,490	\$15,769,047	.....	\$152,412,537
1870,	290,696,671	76,208,390	\$183,946,027	550,851,088
1880,	279,797,882	67,503,784	129,760,476	477,062,142
1890,	558,060,264	150,876,649	121,328,348	830,265,261
1900,	792,356,261	236,871,417	207,895,600	1,237,123,278
1910,	1,044,182,000	346,960,603	265,037,191	1,656,179,794

b—Capital.

Between the years 1890 and 1910 the capital value of manufactures in Pennsylvania was practically doubled, due in part to very large increases in total values of products and in values added by manufacture.

The railroad mileage of Pennsylvania in 1911 was 11,340, equivalent to 25.3 miles for every 100 square miles of territory.

In the following table, the value for farms include land, buildings, implements, machinery, and live stock; manufacturing values include value of land, buildings, machinery, tools, implements, cash and sundries:

CAPITAL REPRESENTED BY FARMS, MANUFACTURING AND RAILROADS.

Year.	Farm properties.	Investments in manufacturing.	Commercial value of railroad operating property.
1890,	\$1,062,939,846	\$1,449,815,000	.....
1900,	1,051,629,173	1,995,837,000	\$1,420,608,000
1910,	1,253,274,862	2,749,006,000	.....

c—Cement Production.

Pennsylvania produces one-third of all Portland cement made in the United States. Most of it is made in the Lehigh Valley. This industry is so important to Pennsylvania that extension of the export trade in this commodity might well receive consideration. In 1913 the total quantity of hydraulic cement exported from the United States was only 2,964,358 barrels, valued at \$4,270,666.

CEMENT PRODUCTION IN PENNSYLVANIA.

Year.	Portland Cement.	
	Barrels.	Value.
1890,	221,000	\$439,050
1895,	504,276	756,414
1900,	4,984,417	4,984,417
1905,	13,813,437	11,195,940
1910,	26,675,978	19,551,268
1911,	26,864,679	19,258,253
1912,	26,441,338	18,918,165
1913,	28,701,845	24,268,800

d—Coal and Coke.

In the year 1912 the combined output of coal (hard and soft) was 246,227,086 short tons valued at \$346,993,123. In that year 86 per cent. of the anthracite and 72 per cent. of the bituminous coal was loaded at the mines for shipment; 2.8 per cent. of the anthracite and 2.4 per cent. of the bituminous coal was sold to local trade; and 10.6 per cent. and 2.2 per cent., respectively, was consumed for generating heat and power at the mines.

Twenty-three and four-tenths per cent. of the bituminous coal was made into coke.

PRODUCTION OF COKE IN PENNSYLVANIA.

Year.	Coke in short tons.	Value at Ovens.	
		Total.	Per ton.
1880,	2,821,384	\$2,255,040	\$1 86
1885,	3,991,805	4,981,656	1 25
1890,	8,560,245	16,333,674	1 91
1895,	9,404,215	11,908,162	1 26
1900,	13,798,893	29,692,258	2 22
1905,	20,573,736	42,253,178	2 05
1908,	15,511,634	32,569,621	2 10
1909,	24,905,525	50,377,035	2 02
1910,	26,315,607	55,254,599	2 10
1911,	21,923,935	43,053,367	1 96
1912,	27,438,693	56,267,838	2 05

Two counties in Pennsylvania—Fayette and Westmoreland—which include the Connellsville and Lower Connellsville Districts, produced (in 1912) 48 per cent. of the coke manufactured in the United States. The Connellsville territory is the greatest coke producing district in the world.

The total amount of anthracite coal in the ground is estimated at 15,000,000,000 tons. At the rate of 100,000,000 tons removed per year, this coal will last 150 years.

Less than \$3,000,000 worth of bituminous coal is exported each year from Philadelphia, although the value of this commodity produced in Pennsylvania in the year 1913 was \$193,000,000.

COAL PRODUCED IN PENNSYLVANIA.

Year.	Bituminous.		Anthracite.	
	Short tons.	Value.	Short tons.	Value.
1840,	464,825	.....	1,064,914	.....
1845,	700,000	.....	2,480,032	.....
1850,	1,000,000	.....	4,138,164	.....
1855,	1,780,000	.....	8,141,754	.....
1860,	2,690,786	\$2,876,579	8,115,842	\$11,869,574
1865,	6,350,000	.....	11,891,746	.....
1870,	7,798,518	13,921,069	15,664,275	38,436,745
1875,	11,760,000	.....	22,485,766	.....
1880,	18,425,163	18,567,129	28,711,379	42,282,948
1885,	26,000,000	24,700,000	38,335,973	76,671,948
1890,	42,302,173	35,376,916	46,468,641	66,383,772
1895,	50,217,223	35,980,357	57,999,337	82,019,272
1900,	79,842,326	77,438,545	57,367,915	85,757,851
1905,	118,413,637	113,390,507	77,659,850	141,875,000
1910,	150,521,526	153,029,510	84,485,236	160,275,302
1911,	144,561,257	146,154,952	90,464,067	175,189,392
1912,	161,865,488	169,370,497	84,361,598	177,622,626
1913,	173,781,217	193,039,806	91,524,922	195,181,127

4.—Commerce and Customs Duties.

The principal commodities of commerce carried on the Delaware River consist of the following:

Coal,
Lumber,
Ores,
Iron and steel products,
Petroleum and its by-products,
Sugar
Grain,
Food-stuffs,
General merchandise.

The situation as to port business, when studied, leads the thoughtful mind to inquire, why it should not be made to increase as the business in Pennsylvania may warrant. That the port business has not increased very much in the last decade is shown in the following three tabular statements. The first table gives the principal articles of commerce and their value as reported by the United States Custom House; the second gives the principal full cargoes brought to the port by the coastwise fleet; and the third table gives the customs duties for ten years past.

COMMERCE OF THE PORT OF PHILADELPHIA FOR THE YEARS 1911,
1912 AND 1913, AS REPORTED BY THE UNITED STATES CUSTOM
HOUSE.

Principal Articles and Value.	1911.	1912.	1913.
Exports.			
Bituminous coal,	\$2,197,725	\$2,378,299	\$2,003,915
Cotton,	3,938,085	4,037,894	3,295,637
Corn,	2,769,723	529,853	920,816
Cattle,	1,231,300	250,100	.....
Flour,	5,436,655	4,365,008	6,123,990
Glazed kid,	2,241,621	1,935,583	1,887,923
Illuminating oil,	14,127,603	14,099,765	13,890,288
Lubricating oil,	5,124,507	5,348,763	5,243,542
Lard,	3,407,391	3,020,064	1,574,235
Neutral lard,	817,793	1,643,925	600,510
Naptha, gasoline, etc.,	1,678,741	1,853,716	3,271,350
Oleo oil,	1,362,635	1,218,049	1,134,187
Paraffin and wax,	1,374,839	1,701,786	1,151,376
Pipe fittings,	1,230,431	1,210,852	841,334
Refined sugar,	128,180	1,259,822	103,376
Wheat,	3,214,007	5,146,135	6,836,325
All other articles,	20,588,412	22,770,003	22,742,163
Totals,	\$70,869,648	\$72,769,617	\$72,236,967
Imports.			
Bananas,	\$1,483,942	\$1,154,493	\$1,173,518
Burlaps,	1,881,405	2,776,595	3,532,801
Cocoonut oil,	214,392	317,259	551,570
Goat skins,	7,396,322	8,182,075	8,993,999
Glycerine,	1,266,098	1,175,059	1,526,021
Iron ore,	3,039,994	4,072,772	4,809,961
Licorice root,	830,343	1,243,940	1,060,443
Manganese ore,	430,895	788,243	916,395
Palm oil,	930,646	1,017,571	1,001,370
Pig iron,	868,689	1,699,709	1,207,475
Soda, nitrate,	1,337,745	1,996,497	2,351,209
Sulphur ore,	548,448	483,453	482,052
Sugar,	9,665,405	11,791,213	9,027,602
Tin in bars,	821,874	720,779	1,030,134
Tobacco wrapper,	1,507,004	1,416,530	1,693,886
Tobacco leaf and other,	1,233,482	1,168,504	1,301,325
Wool, class 1,	629,460	1,795,727	1,149,712
Wool, class 2,	225,085	360,524	560,367
Wool, class 3,	2,726,408	3,766,677	2,797,457
All other articles,	43,350,730	46,638,466	46,680,093
Totals,	\$80,418,277	\$92,566,057	\$91,947,390

PRINCIPAL FULL CARGOES BROUGHT TO THE PORT OF PHILADELPHIA BY THE COASTWISE FLEET FOR THE YEARS 1911, 1912 AND 1913.

(Does not include cargoes of regular line steamships.)

Articles of Import.	1911.	1912.	1913.
Cinders,	34,284 tons	49,875 tons	53,618 tons
Lumber,	219,884,525 ft.	186,027,191 ft.	212,107,867 ft.
Mine props,	86,926 tons	58,242 tons	99,655 tons
Oil,	3,317,787 bbls.	2,758,434 bbls.	3,582,738 bbls.
Piling, .....	.....	11,290 tons	4,300 tons
Pig iron,	42,294 tons	37,438 tons	46,019 tons
Pulp wood,	42,860 tons	30,651 cords	30,468 cords
Phosphate rock,	60,738 tons	41,056 tons	47,003 tons
Ties,	1,397,425	566,383	1,269,702
Shingles,	4,000,000	2,400,000	1,108,000
Stone,	32,165 tons	19,605 tons	20,896 tons
Sand,	14,695 tons	11,133 tons	9,330 tons
Coal tar products,	44,225 bbls.	66,701 bbls.	110,750 tons
Sulphur, .....	.....	12,300 tons	3,900 tons
Tankage, .....	.....	2,456 tons	2,594 tons

CUSTOMS' DUTIES, PORT OF PHILADELPHIA.

Comparative Statement of Quantity and Value of Exports, Imports, and Revenue Collected as Reported by United States Engineer Departments.

Years.	Exports.		Imports.		Revenue collected.
	Quantity—Tons.	Value.	Quantity—Tons.	Value.	
1903,	2,378,307	\$73,184,394	1,561,052	\$55,516,052	\$21,020,331
1904,	2,552,065	66,539,909	1,057,348	53,852,194	17,997,700
1905,	2,267,439	70,645,103	1,365,245	67,913,822	20,022,804
1906,	3,800,995	88,276,315	1,732,935	72,137,678	20,505,545
1907,	4,056,716	106,570,527	1,800,520	80,693,327	21,044,374
1908,	3,532,472	95,533,079	1,551,015	57,407,935	16,963,929
1909,	3,041,433	80,503,231	2,234,039	78,001,864	20,810,442
1910,	2,532,677	65,256,949	2,948,179	89,646,337	21,888,825
1911,	2,945,686	70,869,648	2,622,336	80,418,277	19,571,389
1912,	2,853,436	72,769,617	3,113,336	92,566,087	21,494,085
1913,	2,799,298	72,236,967	3,254,760	91,947,390	19,356,120

5.—*Steamship Lines*

There are 17 trans-Atlantic lines of steamships doing freight or passenger business, or both, between Philadelphia and more than a dozen European ports. During 1913, these lines had 340 sailings, never before equaled in regular-line sailings from Philadelphia. Two tables are given showing the steamship lines, where they dock and the service engaged in for foreign, coastwise, local and inland lines.

STEAMSHIP LINES—PORT OF PHILADELPHIA—WHERE THEY DOCK AND SERVICE.

LOCAL AND INLAND LINES.

Line.	Pier No.	Location.	Service Between Philadelphia and	Sailings.
Augustine Park Steamboat Co.,	4 North,	Arch Street,	Chester, Penningrove, New Castle, Port Penn,	Daily.
Bush Line	10 North,	Race Street,	Marcus Hook, Wilmington, New Castle,	Daily.
Chester Shipping Co.,	4 North,	Arch Street,	Chester and Intermediate Points,	Daily.
Delaware River Trans. Co.,	5 South,	Chestnut Street,	Burlington, Bristol and Intermediate Points,	Daily.
Dover & Phila. Nav. Co.,	5 North,	Arch Street,	Bowers, Beach, Lebanon and Dover,	Daily.
Ericson Line	2 South,	Chestnut Street,	Chester, Delaware City and Baltimore,	Daily.
Frederica & Phila. Nav. Co.,	3 South,	Chestnut Street,	Bowers, Beach and Frederica,	Monthly.
Great Northern Paper Co.,	19 North,	Vine Street,	Stockton Springs, Maine,	Daily.
Millford & Phila. Trans. Co.,	3 South,	Chestnut Street,	Millford and Intermediate Points,	Daily.
Odessa Steamboat Co.,	4 North,	Arch Street,	Port Mott, Port Penn, Middleton and Odessa,	Daily.
Phila., Rancocas & Mt. Holly Transportation Co., ..	4 North,	Arch Street,	Rancocas, Mt. Holly and Intermediate Points,	Daily.
Salem Freight Co.,	4 North,	Between Arch and Race,	Billingsport, Pennsgrove, Pennsville and Salem,	Daily.
Smyrna Steamboat Co.,	4 North,	Arch Street,	Smyrna and Intermediate Points,	Daily.
Trenton Steamboat Co.,	10 North,	Race Street,	Trenton,	Daily.
Wilmington Steamboat Co.,	5 South,	Chestnut Street,	Chester and Wilmington,	Daily.

STEAMSHIP LINES ENTERING THE PORT OF PHILADELPHIA, WHERE THEY DOCK, AND OUT AND INBOUND SERVICE

TRANS-ATLANTIC AND COASTWISE.

Line.	Pier No.	Location.	Outbound Service to	Inbound Service from	Sailings.
American-Indian Line,	34-36 South,	Kennilworth & Christian Sts., Dickinson Street, .....	.....	Bombay, Calcutta,	Monthly.
American-Hawaiian,	60-61 South, .....	.....	.....	Hawaiian Islands & Pacific Coast Ports via Panama Canal,	Monthly.
Atlantic-Transport Line,	46-48-55 South ..	Christian St. & Wash. Ave. below Federal,	London,	London,	Semi-monthly.
Allan Line,	24 North,	Callowhill Street,	Glasgow,	Glasgow, Liverpool, St. Johns, N. F., Halifax, ..	Semi-monthly.
American Line,	53 South,	Washington Ave.,	Liverpool, Queenstown, ..	Liverpool, Queenstown, ..	Weekly.
American-Levant Line,	54 South,	Kennilworth Street,	Smyrna, Alexandria,	Smyrna, Alexandria,	Monthly.
Austro-American Line,	36 South,	Dock Street,	Trieste, Fiume,	Trieste, Fiume,	Semi-monthly.
Atlantic Fruit Co.,	3 South,	Above Chestnut St.,	Jamaica and others,	Jamaica and others,	Weekly.
Bombay-American Line,	Grand Point, ..	Schuykill River,	Leith, Christianna Copen- hagen, Stettin,	Bombay,	Monthly.
Cosmopolitan Line,	A-B-C-D, 27 North,	Above W. Main Street below Noble Street,	Leith, Christianna Copen- hagen, Stettin,	Leith, Christianna Copen- hagen, Stettin,	Weekly.
Clay Line,	27 North,	Grand Schuykill Point, ..	Jamaica,	Jamaica,	Semi-monthly.
Cunco Importing Co.,	10 North,	Race Street,	Norfolk, Newport News and New York,	Norfolk, Newport News & New York,	Weekly.
Clyde Line,	1-2-3 North,	Above Market Street,	West Indies,	West Indies,	Tramp.
Earn Line, .....	.....	Grand Pt.-Port Richmond, Greenwich Pt.	Leith, Middlesboro,	Leith, Middlesboro,	Semi-monthly.
Furness Line,	28 North,	Port Richmond,	Hamburg,	Hamburg,	Bi-monthly.
Hamburg-American Line,	46-48 South,	Washington Avenue, .....	.....	Calcutta,	Monthly.
Hansa Line,	46 South,	Christian Street,	Rotterdam,	Rotterdam,	Every 3 weeks.
Holland-American Line,	48 South,	Washington Avenue,	Naples, Genoa,	Naples, Genoa,	Every 3 weeks.
Italian Line,	19 North,	Above Vine Street,	Naples, Genoa,	Naples, Genoa,	Monthly.
Lloyd-Sabando Line,	19 North,	Above Vine Street,	Manchester, St. Johns, N. 1,	Manchester, St. Johns, N. 1,	Bi-monthly.
Manchester Line,	"D",	Port Richmond, .....	.....	.....	.....

Merchants & Miners Trans. Co., ..	18-24 South,	Spruce to Lombard Sts.,	Jacksonville, Savannah, Pro- vidence, Fall River, Bos- ton.	Jacksonville, Savannah, Pro- vidence, Fall River, Bos- ton.
Munson Line, .....	.....	Port Richmond, Greenwich Pt.	Irregular service,	Irregular service,
North German Lloyd,	34 South,	Fitzwater Street,	Bremen,	Bremen,
Phila.-Trans-Atlantic Line,	25 North,	Pier "A",	London,	London,
Red Star Line,	19 North,	Vine Street,	New Orleans, Charleston, ..	New Orleans, Charleston, ..
Scandinavian-American,	55 South,	Reed Street,	Antwerp,	Antwerp,
Sota & Aznar,	27 North,	Noble Street,	Christiania, Copenhagen, ..	Christiania, Copenhagen, ..
Southern Steamship Co.,	Girard Point,	Schuylkill River,	Spanish Ports,	Spanish Ports,
.....	46 South,	Christian Street,	Tampa, Key West, Jackson- ville, Charleston, ..	Tampa, Key West, Jackson- ville, Charleston, ..
United Fruit Co.,	5 North,	Arch Street,	Jamaica and West India Ports.	Jamaica and West India Ports.

OIL LINES.

Merchants & Miners Trans. Co., ..	18-24 South,	Spruce to Lombard Sts.,	Jacksonville, Savannah, Pro- vidence, Fall River, Bos- ton.	Jacksonville, Savannah, Pro- vidence, Fall River, Bos- ton.
Munson Line, .....	.....	Port Richmond, Greenwich Pt.	Irregular service,	Irregular service,
North German Lloyd,	34 South,	Fitzwater Street,	Bremen,	Bremen,
Phila.-Trans-Atlantic Line,	25 North,	Pier "A",	London,	London,
Red Star Line,	19 North,	Vine Street,	New Orleans, Charleston, ..	New Orleans, Charleston, ..
Scandinavian-American,	55 South,	Reed Street,	Antwerp,	Antwerp,
Sota & Aznar,	27 North,	Noble Street,	Christiania, Copenhagen, ..	Christiania, Copenhagen, ..
Southern Steamship Co.,	Girard Point,	Schuylkill River,	Spanish Ports,	Spanish Ports,
.....	46 South,	Christian Street,	Tampa, Key West, Jackson- ville, Charleston, ..	Tampa, Key West, Jackson- ville, Charleston, ..
United Fruit Co.,	5 North,	Arch Street,	Jamaica and West India Ports.	Jamaica and West India Ports.

PORT FACILITIES.

1.—*Ownership of Water Front.*

Director Norris has said, "The modern port is a complicated piece of machinery, and it cannot be successfully planned or administered without full legislative authority. Private ownership and control of water front facilities in great cities is rapidly becoming obsolete. It is now universally recognized that municipal ownership and control is essential to the proper development of any port. This is particularly true of Philadelphia. Large stretches of available water front on the Delaware River are owned but not used or occupied by transportation companies. The City's ownership amounts to only about ten per cent. (10%). The balance is in private ownership, but is generally split up into very small parcels, and is either wholly undeveloped or only partially developed by the construction of small piers of an obsolete type, and usually with very inadequate docking facilities. It is not generally practicable for these owners to combine adjoining parcels of land, while any attempt by the city to purchase several adjoining pieces is usually blocked by the excessive price demanded by some particular owner who realizes that his holding is essential to the development of a large plan. Even where these individual holdings are capable of development, the owners can hardly be expected to invest additional capital needed for the improvement in competition with municipal piers. It is, therefore, as much to the interest of the individual owner who is willing to sell at a fair price, as it is to the interest of the entire community, that the city should be vested with a general power of eminent domain for the acquisition of wharf property.

This explains why the Legislature of 1913 amended the law so that it is now possible to acquire any water front property needed for any legitimate purpose in connection with the development of the Port. The State may aid. All of which shows that a small beginning only has been made towards the creation of a maritime center at Philadelphia that will be second only to New York in the United States, and one of the important ports in the world.

2.—*Wharves, Docks and Ferries.*

The accompanying table, entitled—Occupation of the Navigable Water Fronts Along the Delaware and Schuylkill Rivers in the City of Philadelphia, as of the year 1913, sub-divided into north and south wharves, Delaware River, and east and west wharves, Schuylkill River, compiled by the Bureau of Engineering, Public Service Commission, gives the location of each property and the owner, description and dimensions, with the leases in force and remarks.

OCCUPATION OF THE NAVIGABLE WATER FRONT ALONG THE DELAWARE AND SCHUYLKILL RIVERS IN THE CITY
OF PHILADELPHIA AS OF THE YEAR 1913.
COMPILED BY THE BUREAU OF ENGINEERING, PUBLIC SERVICE COMMISSION.

DELAWARE RIVER—NORTH WHARVES.

Location of Property.	Owner.		Description.		Leases in Force.		Remarks.
	Private.	Public.	General.	Dimensions. L in Ft. Sq. Ft.			
Pier No. 1—North of Market St.,	Girard Estate, ...	.....	.....	.....	.....	Clyde Steamship Co. of Maine.	
Pier No. 2—North of Market St.,	Girard Estate, ..	.....	.....	.....	.....	Clyde Steamship Co. of Maine.	
Pier No. 3—North of Market St.,	Thomas Clyde Est.,	.....	.....	.....	.....	Clyde Steamship Co. of Maine.	
Bulkhead—S. of Pier No. 4,....	.....	City of Phila.,	Concrete, deep wall, pile and riprap foundation.	72	.....	Clyde Steamship Co. of Maine.	
Pier No. 4—Arch St., .....	.....	City of Phila.,	Open pile substructure with one story steel frame super- structure.	80x530	42,445	Chester Shipping Co. Phila. Rancocas Mt. Holly Co.	
Bulkhead behind pier, .....	.....	City of Phila.,	Concrete, deep wall, pile and riprap foundation.	.....	.....	Woodland Steamboat Co. Odessa Steamboat Co. Smyma Steamboat Co. Washington Park Amuse- ment Co.	
Bulkhead—N. of Pier No. 4,...	.....	City of Phila.,	Concrete, deep wall, pile and riprap foundation.	40	.....	Kerstone Telephone Co. Columbia Transportation Co.	Docking privilege.

DELAWARE RIVER—NORTH WHARVES—Continued.

Location of Property.	Owner.		Description.	Dimensions.		Leases In Force.	Remarks.
	Private.	Public.		General.	<div>Lin.Ft.</div> <div>Sq. Ft.</div>		
Pier No. 5,	United Fruit Co. of Boston.	.....	.....	.....	.....	Lebauon Navigation Co.	
Pier No. 8,	Lehigh Valley Railroad Co.	.....	.....	.....	.....	Sun Oil Co.	
Bulkhead—S. of Pier No. 10,	City of Phila.,	Concrete, deep wall, pile and riprap foundation.	90			
Pier No. 10—Race St.,	City of Phila.,	Open pile substructure, two story steel frame superstructure.	80x539	43,120	Trenton Transportation Co. Cuneo Importing Co.	1/4 mi. from Market St.
Bulkhead behind Pier No. 10,	City of Phila.,	Concrete, deep wall, pile and riprap foundation.				
Bulkhead N. of Pier No. 10,	City of Phila.,	Concrete, deep wall, pile and riprap foundation.				
Bulkhead—S. of Pier No. 11,	City of Phila.,	Concrete, deep wall, pile and riprap foundation.	15	.....	Baltimore and Ohio R. Co.	
Pier No. 11,	City of Phila.,	Open pile substructure, one story timber superstructure.	50x540	31,860	Baltimore and Ohio R. Co.	
Bulkhead behind Pier No. 11,	City of Phila.,	Concrete, deep wall, pile and riprap foundation.	59	.....	Baltimore and Ohio R. Co.	
Bulkhead shed N. Pier No. 11,	City of Phila.,	Open pile substructure, one story timber superstructure.	63x69	3,780	Baltimore and Ohio R. Co.	
Bulkhead behind shed,	City of Phila.,	Concrete, deep wall, pile and riprap foundation.	63	.....	Baltimore and Ohio R. Co.	

Pier No. 12,	Penna. Co. for Insurance on Lives and granting Annuities.	.....	Concrete, deep wall, pile and riprap foundation.	.....	Baltimore and Ohio R. R. Co.	.....
Summer St.—Bulkhead, .....	.....	.....	.....	15	.....	.....
Pier No. 13,	Penna. R. R. Co.,	City of Phila.,	.....	.....	.....	.....
Pier No. 14,	Penna. R. R. Co.,	City of Phila.,	Open pile substructure, one story, corrugated superstructure.	107	Cooper Point and Phila. Ferry Co.	.....
Pier No. 15,	Penna. R. R. Co.,	City of Phila.,	Concrete wall, on timber platform and piles.	107	.....	.....
Vine St. Ferry Slip, .....	.....	City of Phila.,	Concrete wall on timber platform and piles.	228	.....	.....
Bulkhead behind Ferry Slip, ..	.....	City of Phila.,	Concrete cross wall on piles, substructure, with two story steel frame superstructure.	166x562	Phila. and New Orleans Transportation Co.	$\frac{1}{2}$ mi. from Market st.
Pier No. 19—Vine St., .....	.....	City of Phila.,	Concrete wall on timber platform and piles.	106	A. S. Palmer, Great Northern Paper Co.	.....
Bulkhead behind Pier No. 19, ..	.....	City of Phila.,	Concrete wall on timber platform and piles.	104	.....	.....
Bulkhead—S. of Callowhill St.,	.....	City of Phila.,	.....	50	Allen Steamship Line.	.....
Callowhill St. Bulkhead,	Phila. & Read. R.	.....	.....	.....	Phila. Trans-Atlantic Line.	.....
Pier No. 24,	R.	.....	.....	.....	Phil. Line.	.....
Pier No. 26,	Phila. & Read. R.	.....	.....	.....	Holland-Americann Line.	.....
Pier No. 28,	R.	.....	.....	.....	.....	.....
Pier No. 29,	Phila. & Read. R.	.....	.....	.....	.....	.....
Pier No. 30,	R.	.....	.....	.....	.....	.....
Pier No. 31,	Phila. & Read. R.	.....	.....	.....	Alex. Kerr Bros.	.....
Bulkhead—S. Pier No. 32,	Geo. H. Kidd.	City of Phila.,	Solid crib,	14	Geo. W. Kugler & Son.	.....
Pier No. 32—Green St., .....	.....	City of Phila.,	Solid crib substructure, no superstructure.	51x530	Geo. W. Kugler & Son.	.....
Lot behind Pier No. 32, .....	.....	City of Phila.,	.....	64x77	Geo. W. Kugler & Son.	.....
N. W. Corner Delaware Ave. and Green St.	.....	City of Phila.,	1-story brick office and store house and timber shed.	64x150	Geo. W. Kugler & Son.	.....
Pier No. 33,	Phila. Rapid Transit Co.	.....	.....	.....	.....	$\frac{3}{4}$ mi. from Market St.

DELAWARE RIVER—NORTH WHARVES—Continued.

Location of property.	Owner.		Description.	Dimensions.		Leases in Force.	Remarks.
	Private.	Public.	General.	Lin.Ft.	Sq.Ft.		
Pier No. 34,	Phila. Rapid Transit Co.	City of Phila.,	Concrete wall on timber platform and piles.	36			
Bulkhead S. of Fairmount Ave.,	.....	City of Phila.,	Solid crih substructure except on south side from off-set in which crih is on piles; no superstructure.	irregular shape	23,900	Cornworth Bell Co.	
Pier No. 35—Fairmount Ave.,....	.....	City of Phila.,	1½ story brick building for storage	60x150	9,076	Samuel Hamilton.	
S. W. Corner Delaware and Fairmount Avenues.	.....	City of Phila.,	15x30, timber storehouse and shed 20x58, stable 50x100, timber shed with corrugated iron roof 20x88.				
Bulkhead N. of Pier No. 35, ..	.....	City of Phila.,	Concrete wall on timber platform and piles.	22			
Department Shop, .....	.....	City of Phila.,	Wood frame,	21x32	682	Department of Wharves, Docks and Ferries. American Ice Co.	
Pier No. 33,	Thos. H. Powers Estate.	.....	.....	.....	.....
Canal St.—Bulkhead,	Thos. H. Powers Estate.	City of Phila.,	Crib on piles,	40	.....	
Pier No. 36, .....	.....	City of Phila.,	.....	.....	.....	Chas. F. Felin Co.	
Poplar St.—Bulkhead. Lot behind Poplar St. Bulkhead.	.....	City of Phila.,	Solid crih,	50			
Pier No. 37,	Edwin Henson & Clayton Nichols.	City of Phila.,	.....	50x200	10,000	Edwin F. Henson.	
Pier No. 38, .....	.....	.....	.....	.....	.....

[illegible]

DELAWARE RIVER—NORTH WHARVES—Continued.

Location of Property.	Owner.		Description.		Leases in Force.	Remarks.
	Private.	Public.	General.	Dimensions. Lin.Ft. Sq.Ft.		
Lot behind Bulkhead, .....	.....	City of Phila.,	Timber trestle run- way and dump platform sub struc- ture.	45x232 10,482	Kensington Ship Yard Co.,....	1½ mi. from Market St.
Pier No. 62,	Wm. Cramp & Sons Ship and Engine Bldg. Co.	.....	.....	.....	Kensington Ship Yard Co.	
Pier No. 62½,	Wm. Cramp & Sons Ship and Engine Bldg. Co.	.....	.....	.....	Kensington Ship Yard Co.	
Pier No. 63,	Wm. Cramp & Sons Ship and Engine Bldg. Co.	.....	.....	.....	Kensington Ship Yard Co.	
Pier No. 63½,	Wm. Cramp & Sons Ship and Engine Bldg. Co.	.....	.....	.....	Kensington Ship Yard Co.	
Pier No. 65,	Wm. Cramp & Sons Ship and Engine Bldg. Co.	.....	.....	.....	Kensington Ship Yard Co.	
Pier No. 66,	Hughes & Patter- son.	.....	.....	.....	Kensington Ship Yard Co.	
Pier No. 67,	DeFrain Sand Co.,	City of Phila.,	Concrete wall on timber platform and piles.	30 30x332	DeFrain Sand Co.	
Lot behind Bulkhead, .....	.....	.....	.....	.....	.....
Pier No. 68,	Wm. M. Lloyd Co.,	.....	.....	.....	.....
Pier No. 69,	Wm. M. Lloyd Co.,	.....	.....	.....	.....
Bulkhead S. of Pier No. 70, ..	.....	City of Phila.,	Solid crib,	28 77x290	.....
Lot behind Pier No. 70, .....	.....	City of Phila.,	Storage yard of City Water Bureau.	.....	20,150	
Pier No. 70—E. Susquehanna Ave. ....	.....	City of Phila.,	Solid crib sub struc- ture, one story covered with gal- vanized iron, re- creation pavillion 24x47.	50x265	13,117	

Pier No. 71,	Hughes & Patter- son.	.....	.....	.....	.....	Seaman and Mannough.
Pier No. 72,	Hughes & Patter- son.	.....	.....	.....	.....	Hainesport Mining and Transportation Co.
Dyott St.—Bulkhead, .....	.....	.....	.....	100	.....	.....
Pier No. 75,	Lehigh Coal and Navigation Co.	.....	.....	Concrete wall on timber platform and piles—outlet for sewer 8½'x14'.	.....	Bernard and Samsel Towing Line.
Pier No. 76,	Lehigh Coal and Navigation Co.	.....	.....	.....	.....	Bernard and Samsel Towing Line.
Pier No. 77,	Wm. Cramp & Sons Ship and Engine Building Co.	.....	.....	.....	.....	.....
Pier No. 78,	Wm. Cramp & Sons Ship and Engine Building Co.	.....	.....	.....	.....	.....
Pier No. 79,	Wm. Cramp & Sons Ship and Engine Building Co.	.....	.....	.....	.....	.....
Pier No. 80,	Wm. Cramp & Sons Ship and Engine Building Co.	.....	.....	.....	.....	.....
Pier No. 81,	Wm. Cramp & Sons Ship and Engine Building Co.	.....	.....	.....	.....	.....
Pier No. 82,	Wm. Cramp & Sons Ship and Engine Building Co.	.....	.....	.....	.....	.....
Pier No. 83,	Wm. Cramp & Sons Ship and Engine Building Co.	.....	.....	.....	.....	.....
Pier No. 85,	Wm. Cramp & Sons Ship and Engine Building Co.	.....	.....	.....	.....	.....
Pier No. 86,	Wm. Cramp & Sons Ship and Engine Building Co.	.....	.....	.....	.....	.....
Pier No. 20 (beginning 3d series),	Wm. Cramp & Sons Ship and Engine Building Co.	.....	.....	.....	.....	.....
Pier No. 18,	Phila. & Read. R. R.	.....	.....	.....	.....	.....
Pier No. 16,	Phila. & Read. R. R.	.....	.....	.....	.....	.....
Pier No. 15,	Phila. & Read. R. R.	.....	.....	.....	.....	.....
Pier No. 14,	Phila. & Read. R. R.	.....	.....	.....	.....	.....
Pier No. 13,	Phila. & Read. R. R.	.....	.....	.....	.....	.....
		.....	.....	.....	.....	2 mi. from Market St.

DELAWARE RIVER—NORTH WHARVES—Continued.

Location of Property.	Owner.		Description.		Leases in Force.	Remarks.
	Private.	Public.	General.	Dimensions. Lin. Ft. Sq. Ft.		
Pier No. 12,	Phila. & Read. R.					
Pier No. 11,	Phila. & Read. R.					
Pier No. 10,	Phila. & Read. R.					
Pier No. 9,	Phila. & Read. R.					
Pier No. 8,	Phila. & Read. R.					
Pier No. 7,	Phila. & Read. R.					
Pier No. 6,	Phila. & Read. R.					
Pier No. 5,	Phila. & Read. R.					
Pier No. 4,	Phila. & Read. R.					2½ mi. from Market St.
Pier No. 3,	Phila. & Read. R.					
Pier No. 2,	Phila. & Read. R.					
Pier No. 1,	Phila. & Read. R.					
Pier A,	Phila. & Read. R.					
Pier B,	Phila. & Read. R.					
Pier C,	Phila. & Read. R.					
Pier D,	Phila. & Read. R.					2½ mi. from Market St.
Pier E,	Phila. & Read. R.					
Pier F,	Phila. & Read. R.					
Pier G,	Phila. & Read. R.					
Pier H,	Phila. & Read. R.					3 mi. from Market St.

Pier J,	Phila. & Read. R. R.	City of Phila.,	Outlet from sewer,	28 57x511	29,127	United Gas Improvement Co.,	3 3/4 mi. from Market St.
Bulkhead S. of Pier No. 125,	City of Phila.,	Solid crib substructure and one story timber recreation pavillion 42x36.	.....	.....	United Gas Improvement Co., .....	.....
Pier No. 126 Allegheny Ave.,	Dry rubble wall,	35 64	.....	United Gas Improvement Co., .....	.....
Bank unprotected,	City of Phila.,	Dry rubble wall,	5 75x550	41,250	United Gas Improvement Co., .....	.....
Bank N. of Tioga St.,	City of Phila.,	Solid crib substructure, no super- structure.	80 irregu lar	25,385	United Gas Improvement Co., .....	.....
First pier N. of Tioga St.,	City of Phila.,	Part solid crib, part pile substructure, lar	145 15	.....	United Gas Improvement Co., .....	.....
Bulkhead N. of first pier,	City of Phila.,	Solid crib, .....	.....	.....	United Gas Improvement Co., .....	.....
Second pier N. of Tioga St.,	City of Phila.,	Dry rubble wall,	64	.....	Pierson & Ludasher Lum- ber Co.	.....
Bulkhead N. of Pier,
Bank N. of Bulkhead,
Pier near Westmoreland St.,
Pier near Westmoreland St.,
Venango St. Bank,	City of Phila.,	Dry rubble wall,	64	.....	.....	3 3/4 mi. from Market St.
Pier-N. of Venango St.,	5 3/4 mi. from Market St.
Bridge St.—Pier,	City of Phila.,	Solid crib substructure, double deck recreation pavillion 51x24 superstruc- ture.	40x80	3,200	.....	.....
Orthodox St. Bank,	City of Phila.,	Dry rubble wall,	60 60	.....	.....	.....
Robbins St.—Bulkhead,	City of Phila.,	Concrete wall on crib	.....	.....	Lardner Point Pumping Station.	.....
Bulkhead—N. of Robbins St.,	City of Phila.,	Concrete wall on crib	17	.....	Lardner Point Pumping Station.	.....
1st Pier—N. of Robbins St.,	City of Phila.,	Solid crib substructure, no super- structure.	50x82	4,600	Lardner Point Pumping Station.	.....
Bulkhead—N. of first pier,	City of Phila.,	Solid crib,	199	.....	Lardner Point Pumping Station.	.....
Bulkhead—N. of first pier,	City of Phila.,	dry rubble wall,	125	.....	Lardner Point Pumping Station.	.....
Bank N. of first pier,	City of Phila.,	Unprotected,	125	.....	Lardner Point Pumping Station.	.....
2d Pier N. of Robbins St.,	City of Phila.,	Concrete wall on timber platform and piles; sub- structure; no sup- erstructure.	23x180	5,940	Lardner Point Pumping Station.	.....

DELAWARE RIVER—NORTH WHARVES—Continued.

Location of Property.	Owner.		Description.	Dimensions.		Leases in Force.	Remarks.
				General.	Lin.Ft.		
	Private.	Public.					
Levick St.—Bulkhead,	City of Phila.,	Concrete face wall, ..	60	.....	Lardner Point Pumping Station.	7 mi. from Market St.
Pier—House of Correction,	City of Phila.,	Solid crib substructure, two story timber store house belonging to Dept. of Wharves, Docks and Ferries.	54x50	22,500	House of Correction,	8½ mi. from Market St.
Pennypack Creek Bulkhead from House of Correction to Pennypack Creek.	City of Phila.,	Dry rubble wall,	3,200	.....	House of Correction.	
Bank—Torresdale Creek to Torresdale Coal Pier.	City of Phila.,	Unprotected,	1,186	.....	Torresdale Filter Plant,	9½ mi. from Market St.
Pier—Torresdale Coal Pier,	City of Phila.,	Open pile substructure, no superstructure.	33x39	11,700	Torresdale Filter Plant.	
Bank N. of coal Pier,	City of Phila.,	Unprotected,	500	.....	Torresdale Filter Plant.	
Pennypack St.—Pier,	City of Phila.,	Open pile substructure, no superstructure.	60x100	6,000	Torresdale Filter Plant.	
Bank—to Linden St.,	City of Phila.,	Unprotected,	3,409	.....	Torresdale Filter Plant,	10½ mi. from Market St.
Bank—Linden to Arendell St.,	City of Phila.,	Dry rubble wall,	601	.....	Pleasant Hill Park.	
Lot behind Bank,	City of Phila.,	.....	601x190	114,190	Pleasant Hill Park.	
Bank—Arendell St. to Fishers Landing.	City of Phila.,	Dry rubble wall,	170	.....	Pleasant Hill Park,	10½ mi. from Market St.
Lot behind Bank,	City of Phila.,	.....	170x190	32,300	Pleasant Hill Park.	

DELAWARE RIVER—SOUTH WHARVES

Location of Property.	Owner.		Description.		Leases in Force.	Remarks.
	Private.	Public.	General.	Dimensions. Lin. Ft. Sq. Ft.		
Ferry Slip—N. of Market St., .. Market St.—Ferry Slip,	Penna. R. R. Co.	City of Phila.,	Timber piles and short steel columns substructure, two story steel and timber frame with metal covering superstructure. Concrete, deep wall, pile and riprap foundation.	100	Camden and Philadelphia Steamboat Co. West Jersey Ferry Co.	
Bulkhead behind Slip, Ferry Slip S. of Market St.,	Penna. R. R. Co.	City of Phila.,	Concrete, deep wall, pile and riprap foundation.	100	Porter, Gildersleeve Co.	
Pier No. 1,	Wm. J. Thompson,	City of Phila.,	Concrete, deep wall, pile and riprap foundation.	10	Atlantic Fruit Co. U. S. Government. Frederica, Phila. Navigation Co.	
Pier No. 3,	Phila. & Baltimore Steamship Co. .....	.....	.....	.....	Millford Navigation Co. Ericson Line.	
Bulkhead N. of Pier No. 5...	.....	City of Phila.,	Concrete, deep wall, pile and riprap foundation.	74	Delaware River Transportation Co. Wilmington Steamboat Co. Phila. & Reading R. R. Co.	
Pier No. 5—Chestnut St., .....	.....	City of Phila.,	Open pile substructure, two story steel frame metal covered superstructure, recreation pavilion on upper deck. Concrete, deep wall, pile and riprap foundation.	80x552 44,299 80		
Bulkhead behind Pier No. 5, ..	.....	City of Phila.,	.....	80		

Pier No. 22,	Baltimore & Ohio R. Co.	.....	.....	.....	.....	.....	Merchants and Miners Transportation Co.	1 mi. from Market St. docking privilege.
Lomhard St.—Bulkhead, .....	.....	City of Phila.,	Concrete, deep wall and riprap foundation.	.....	.....	.....	Merchants and Miners Transportation Co.	.....
Pier No. 24,	Baltimore & Ohio R. Co.	.....	.....	.....	.....	.....	Merchants and Miners Transportation Co.	.....
Ferry Slip—N. of South St.,	Phila. & Read. R. R.	.....	.....	.....	.....	.....	Merchants and Miners Transportation Co.	.....
South St.—Ferry Slip, .....	.....	City of Phila.,	Timber pile and platform substructure, two and a half story steel frame metal covered superstructure, outlet for sewer.	77	.....	.....	Delaware River Ferry Co.	.....
Bulkhead behind South St. Ferry Slip.	.....	City of Phila.,	Concrete wall on timber platform and piles.	77	.....	.....	Gloucester Ferry Co.	.....
Pier No. 28,	Franklin Sugar Refining Co.	.....	.....	.....	.....	.....	Independent Pier Co.	.....
Pier No. 30,	Franklin Sugar Refining Co.	.....	.....	.....	.....	.....	Any vessel may purchase dockage.	.....
Kenilworth St.—Bulkhead, .....	.....	City of Phila.,	Concrete wall on timber platform and piles.	99	.....	.....	Any vessel may purchase dockage.	.....
Pier No. 31,	Franklin Sugar Refining Co.	.....	.....	.....	.....	.....	Any vessel may purchase dockage.	.....
Pier No. 32,	Franklin Sugar Refining Co.	.....	.....	.....	.....	.....	Any vessel may purchase dockage.	.....
Pier No. 33,	Franklin Sugar Refining Co.	.....	.....	.....	.....	.....	Any vessel may purchase dockage.	.....
Pier No. 34,	Phila. & Read. R. R.	.....	.....	.....	.....	.....	Any vessel may purchase dockage.	.....
Pier No. 35,	Phila. & Read. R. R.	.....	.....	.....	.....	.....	Independent Pier Co.,	3 mi. from Market St.
Fitzwater St.—Bulkhead, .....	.....	.....	.....	.....	.....	.....	Independent Pier Co.,	.....
Catbarine St.—Bulkhead Shed, ..	.....	City of Phila.,	Concrete wall on timber platform and piles.	50	.....	.....	.....	.....
Bulkhead behind Sbed, .....	.....	City of Phila.,	Concrete wall on piles.	103x35	3,601	.....	.....	.....
.....	.....	City of Phila.,	Concrete wall on timber platform and piles 51 Lin. Ft. proposed.	103	.....	.....	.....	.....
Pier No. 39,	American Ice Co.	.....	.....	.....	.....	.....	.....	.....
Pier No. 38—Queen St., .....	.....	City of Phila.,	Proposed,	180x551	99,203	.....	.....	.....
Bulkhead behind Pier No. 38, ..	.....	City of Phila.,	Concrete wall on timber platform and piles.	183	.....	.....	.....	.....

DELAWARE RIVER—SOUTH WHARVES—Continued.

Location of Property.	Owner.		Description.	Dimensions.		Leases in Force.	Remarks.
				General.	Lin.Ft. Sq.Ft.		
Bulkhead shed S. of Pier No. 38. Bulkhead behind shed, .....	.....	City of Phila.,	Proposed,	Concrete wall on timber platform and piles 150 Lin. Ft. proposed 53 Lin. Ft.	203x35 7,117		
Pier No. 40—N. of Christian St., Bulkhead behind Pier No. 40, ..	.....	City of Phila.,	Proposed,	Concrete wall on timber platform and piles.	180x553 99,617		
Bulkhead S. of Pier No. 40, ..	.....	City of Phila.,	Proposed,	Concrete wall on timber platform and piles.	129		1 mi. from Market St.
Christian St.—Bulkhead, .....	.....	City of Phila.,	Proposed,	Concrete wall on timber platform and piles.	.....	International Marine Co. International Marine Co. Pennsylvania R. R. Co.	
Pier No. 46,	Penna. R. R. Co.,	.....	.....	.....	.....	.....
Pier No. 48,	Penna. R. R. Co.,	.....	.....	.....	.....	.....
Bulkhead N. of Pier No. 49, ..	.....	City of Phila.,	Crib on piles, .....	.....	26	.....
Pier No. 49—Washington Ave., ..	.....	City of Phila.,	Crib on piles sub-structure, no super-structure.	.....	60x125	7,500	
Bulkhead S. of Pier No. 49, ..	.....	City of Phila.,	Crib on piles, .....	.....	16	.....
Pier No. 52,	Penna. R. R. Co.,	.....	.....	.....	.....	.....
Pier No. 55,	Penna. R. R. Co.,	.....	.....	.....	.....	.....
Pier No. 57,	Penna. R. R. Co.,	.....	.....	.....	.....	.....
Reed St.—Bulkhead, .....	.....	City of Phila.,	Concrete wall on timber platform and piles.	.....	56	.....	1 1/2 mi. from Market St.
Pier No. 59,	Spreckles Sugar Refining Co.	.....	.....	.....	.....	.....

SCHUYLKILL RIVER—EAST WHARVES.

Location of Property.	Owner.		Description.		Leases in Force.	Remarks.
	Private.	Public.	General.	Dimensions. Lin. Ft. Sq. Ft.		
Fairmount Park—Bulkhead, Springarden St. Bridge—Bulkhead.	.....	City of Phila., City of Phila.,	Solid masonry, Stone bridge abutment.	540 50	.....	7½ mi. from mouth of Schuylkill River.
Bulkhead—S. of Springarden St.	Thos. Lockhart Co.	.....	.....	.....	.....	.....
Bulkhead—S. of Springarden St.	Phila. Elec. Co.	.....	.....	.....	.....	.....
Bulkhead—S. of Springarden St.	H. D. Stratton Ice Co.	.....	.....	.....	.....	.....
Bulkhead—S. of Springarden St.	C. D. Norton, ....	.....	.....	.....	.....	.....
Bulkhead—S. of Springarden St.	Baltimore & Ohio R. Co.	.....	.....	.....	Conroy Coal Co.	.....
Bulkhead—S. of Springarden St.	Baltimore & Ohio R. Co.	.....	.....	.....	Peoples Bros.	.....
Bulkhead—S. of Springarden St.	Baltimore & Ohio R. Co.	.....	.....	.....	Penn Reduction Co.	.....
Bulkhead—S. of Springarden St.	Knickerbocker Lime Co.	.....	.....	.....	.....	.....
Powelton Ave.—Bulkhead, Wood St.—Bulkhead, Bulkhead between Vine and Wood Sts.	Ford & Kendig Co. John Lang Paper Co.	City of Phila.,	.....	41	.....	7 mi. from mouth of Schuylkill River.
Vine St.—Bulkhead, ....	.....	City of Phila.,	Crib on piles, outlet sewer.	55	.....	.....
Lot behind Bulkhead, ....	.....	City of Phila.,	.....	55x12	Schuylkill River Eastside R. Co.	.....
Race St.—Bulkhead, ....	.....	City of Phila.,	Crib on piles, outlet sewer.	51	.....	6½ mi. from mouth of Schuylkill River.
Cherry St.—Bulkhead, ....	.....	City of Phila.,	.....	40	.....	.....
Lot behind Bulkhead, ....	.....	City of Phila.,	.....	40x41	.....	.....
Market St. Bridge—Bulkhead, ..	.....	City of Phila.,	Solid crib, outlet sewer.	204	.....	.....
Lot behind bulkhead, ....	.....	City of Phila.,	.....	203x41	.....	6½ mi. from mouth of Schuylkill River.
				8,360		

Chestnut St. Bridge—Bulkhead, ..	.....	City of Phila.,	Solid crib,	103 103x78	8,034	.....	.....	6 1/2 mi. from mouth of Schuylkill River.
Lot behind Bulkhead, .....	.....	City of Phila.,	.....	.....	.....	.....	.....	.....
Bulkhead between Walnut and Chestnut Sts.	Baltimore & Ohio R. R. Co.	.....	.....	.....	.....	.....	P. Elmer Weitzell Bros. & Sons.	.....
Bulkhead between Locust and Walnut Sts.	Collins & Lippin- cott.	City of Phila.,	Crib on piles, outlet sewer.	41 40x40	1,600	.....	Schuylkill River Eastside R. R. Co.	.....
Sansom St.—Bulkhead, .....	.....	City of Phila.,	.....	.....	.....	.....	.....	.....
Lot behind Bulkhead, .....	.....	City of Phila.,	Crib on piles, outlet sewer.	52 52x90 54	4,680	.....	.....	.....
Walnut St. Bridge—Bulkhead, ..	.....	City of Phila.,	Concrete wall on timber platform and piles, outlet sewer.	.....	6,600	.....	.....	.....
Lot behind Bulkhead, .....	.....	City of Phila.,	Crib on piles, outlet sewer.	55x120 55	1,375	.....	.....	.....
Locust St.—Bulkhead, .....	.....	City of Phila.,	.....	55x25	.....	.....	.....	.....
Lot behind Bulkhead, .....	.....	City of Phila.,	.....	.....	.....	.....	.....	.....
Lot behind Bulkhead,	American Ice Co.	City of Phila.,	.....	65	.....	.....	.....	6 mi. from mouth of Schuylkill River
Bulkhead S. of Spruce St.,	S. E. and J. J. Dougahy.	City of Phila.,	Solid crib, sewer outlet.	65x16	1,040	.....	.....	.....
Bulkhead S. of Spruce St., .....	.....	City of Phila.,	.....	.....	.....	.....	Geo. B. Newton Co.	.....
Pine St.—Bulkhead, .....	.....	.....	.....	.....	.....	.....	.....	.....
Lot behind Bulkhead, .....	.....	.....	.....	.....	.....	.....	.....	.....
Bulkhead S. of Pine St.,	Herbert Henderson Co.	.....	.....	.....	.....	.....	.....	.....
Bulkhead N. of Lombard St.,...	J. S. Lowry & Sons.	City of Phila.,	Crib on piles, sewer outlet.	69	.....	.....	.....	.....
Lombard St.—Bulkhead, .....	.....	City of Phila.,	.....	69x43	2,980	.....	Standard Ice Manufacturing Co.	.....
Lot behind Bulkhead, .....	.....	.....	.....	.....	.....	.....	Chas. F. Felln Co., .....	.....
Bulkhead—N. of South St. Bridge.	Standard Ice Manu- facturing Co.	City of Phila.,	Solid crib, sewer outlet.	221	.....	.....	.....	5 1/2 mi. from mouth of Schuylkill River.
South St. Bridge—Bulkhead, ...	.....	City of Phila.,	.....	221x64	14,144	.....	Geo. B. Newton Coal Co.	.....
Lot behind Bulkhead, .....	.....	City of Phila.,	.....	68	.....	.....	Alex. Ray.	.....
Bulkhead—N. of Bainbridge St.,	Geo. B. Newton.	City of Phila.,	Solid crib, sewer outlet.	50x122	6,100	.....	John C. Hancock.	.....
Bainbridge St.—Bulkhead, .....	.....	City of Phila.,	.....	.....	.....	.....	.....	.....
Lot behind Bulkhead,	H. C. Fox & Sons.	City of Phila.,	.....	.....	.....	.....	.....	.....
Bulkhead—S. of Bainbridge St.,	Phila. Rapid Tran- sit Co.	.....	.....	.....	.....	.....	.....	.....
Bulkhead—S. of Bainbridge St.,	Phila. Rapid Tran- sit Co.	.....	.....	.....	.....	.....	.....	.....
Bulkhead—S. of Bainbridge St.,	.....	.....	.....	.....	.....	.....	.....	5 1/2 mi. from mouth of Schuylkill River.

SCHUYLKILL RIVER—EAST WHARVES—Continued.

Location of Property.	Owner.		Description.	Dimensions.		Leases in Force.	Remarks.	
	Private.	Public.		General.	Lin.Ft.			Sq.Ft.
Bulkhead—N. of Christian St., Bulkhead—S. of Christian St., Christian St. R. R. Bridge— Bulkhead.	DeFrain Sand Co. Phila. Elec. Co. U. S. Government.							
Peltz St.—Bulkhead,	Fred R. Gery Co.	City of Phila.,	Solid crib, sewer outlet.	29			5 $\frac{1}{4}$ mi. from mouth of Schuylkill River.	
Ellsworth St.—Bulkhead,	Harrison Bros. & Co.	City of Phila.,	.....	25x90	2,250		4 $\frac{1}{2}$ mi. from mouth of Schuylkill River
Lot behind Bulkhead,	B. B. Martin & Co.	.....	.....	.....	.....		.....
Bulkhead N. of Grays Ferry Bridge.	.....	City of Phila.,	Bank unprotected,....	60	7,800		.....
Grays Ferry Bridge—Bulkhead,...	.....	City of Phila.,	.....	60x130			.....
Lot behind Bulkhead,	Michael Ehret, Jr., & Co.	City of Phila.,	.....	.....	.....		.....
Bulkhead off of the foot of Wharton St.	Phila. Rubber Co.	.....	.....	.....	.....		.....
Bulkhead—N. of B. & O. R. R. Bridge.	American Incin- erating Co.	.....	.....	.....	.....		4 mi. from mouth of Schuylkill River.
Bulkhead—S. of B. & O. R. R. Bridge.	.....	City of Phila.,	.....	.....	.....	United Gas Improvement Co.	.....
Bulkhead—N. of Passyunk Ave. Bridge.	.....	City of Phila.,	Miscellaneous,	1,243	.....	.....	.....
Bulkhead—Passyunk Ave. to 34th St.	.....	City of Phila.,	Crib on piles, sewer outlet.	100	.....	United Gas Improvement Co.	2 $\frac{3}{4}$ mi. from mouth of Schuylkill River.
Lot behind Bulkhead, .....	.....	City of Phila.,	.....	.....	.....	.....	.....
Passyunk Ave. Bridge—Bulkhead, Bulkhead opposite 35th St.,	Girard Estate, ...	.....	Unprotected bank,...	50	.....	Peoples Bros.,	1 mi. from mouth of Schuylkill River.
Penrose Ferry Bridge—Bulkhead, Bulkhead from 26th St. north,	.....	City of Phila.,	.....	.....	.....	.....	3 mi. from mouth of Schuylkill River.
	Girard Point Stor- age Co.	.....	.....	1,400	.....	.....	Schuylkill River.

SCHUYLKILL RIVER—WEST WHARVES.

Location of Property.	Owner.		Description.		Leases in Force.	Remarks.
	Private.	Public.	General.	Dimensions. Lin.Ft. Sq.Ft.		
Fairmount Park—Bulkhead, .....	.....	City of Phila.,	Solid crib to locks. Dry masonry dam.	1,750	.....	7 $\frac{1}{2}$ mi. from mouth of Schuylkill River.
Springarden St.—Bulkhead, .....	.....	City of Phila.,	Solid crib.	62	.....	.....
Bulkhead—S. of Springarden St.	Phila. & Read. R. Co.	.....	.....	.....	Peoples Bros.	.....
Bulkhead—S. of Springarden St.	Phila. & Read. R. Co.	.....	.....	.....	Bernard Connard.	.....
Bulkhead—S. of Springarden St.	Phila. & Read. R. Co.	.....	.....	.....	Jos. Burke.	.....
Bulkhead—S. of Springarden St.	Phila. & Read. R. Co.	.....	.....	.....	Mrs. J. J. Clancy.	.....
Bulkhead—S. of Springarden St.	Atlantic Refining Co.	.....	.....	.....	Barber Asphalt Co.	7 mi. from mouth of Schuylkill River.
Bulkhead—S. of Springarden St.	Phila. & Read. R. Co.	.....	.....	.....	Henry Holt.	.....
Bulkhead—S. of Springarden St.	Phila. & Read. R. Co.	.....	.....	.....	West. Phila. Stock Yard Co.	.....
Bulkhead—S. of Springarden St., Market St.—Bulkhead,	Penna. R. R. Co.	City of Phila.,	Solid crib. sewer outlet.	199	.....	6 $\frac{1}{2}$ mi. from mouth of Schuylkill River.
Chestnut St. Bridge—Bulkhead, ..	.....	City of Phila.,	Bridge abutment, ..	82	.....	.....
Bulkhead—S. of Chestnut St.,	Geo. E. Newton Co.	.....	.....	.....	Stokes Bros. Lumber Co.	.....
Bulkhead—S. of Chestnut St.,	P. H. Fairbank.	.....	.....	.....	.....	.....
Bulkhead—S. of Chestnut St.,	Wetherill Bros.,	.....	.....	.....	.....	.....
Bulkhead—N. of Walnut St Bridge.	Vermont Marble Co.	.....	.....	.....	.....	.....
Walnut St. Bridge—Bulkhead, ..	.....	City of Phila.,	Crib on piles, sewer outlet.	82	.....	6 $\frac{1}{2}$ mi. from mouth of Schuylkill River.
Lot behind Bulkhead, .....	.....	City of Phila.,	.....	80x300	2,400	.....
Bulkhead—S. of Walnut St. Bridge.	Geo. B. Newton Co.	.....	.....	.....	Vermont Marble Co.	.....
Bulkhead—S. of Walnut St. Bridge.	Continental Nat'l. Bank, N. Y. City.	.....	.....	.....	John Warner Co.,	6 mi. from mouth of Schuylkill River.
Bulkhead—S. of Walnut St. Bridge.	Realty Security Co.	.....	.....	.....	Pintsch Compressing Co.	.....

SCHUYLKILL RIVER—WEST WHARVES—Continued.

Location of Property.	Owner.		Description.		Dimensions.		Leases in Force.	Remarks.
	Private.	Public.	General.		Lin. Ft.	Sq. Ft.		
Larchwood Ave.—Bulkhead,	City of Phila.,	Concrete wall on timber platform and piles, sewer outlet.		52			
Lot behind Bulkhead,	City of Phila.,	.....		50x275			
Bulkhead—N. of South St. Bridge,	Penna. R. R. Co.,	.....	.....		.....	13,750	John Maxwell's Sons, Hovey & White Co.	
Bulkhead—N. of South St. Bridge,	City of Phila.,	.....		.....	.....	Franklin Smith.	
Bulkhead—N. of South St. Bridge,	City of Phila.,	Concrete on piles, crib on piles.		452			
Lot behind Bulkhead,	City of Phila.,	.....		443x251	111,193	John Maxwell's Sons.	
South St. Bank under bridge,	City of Phila.,	Slope ripped,		81			5 $\frac{1}{2}$ mi. from mouth of Schuylkill River.
Lot behind Bank,	City of Phila.,	.....		80x250	20,000		
Wharf S. of South St.,	City of Phila.,	Solid crib,		54x48	2,592	Almsbouse Wharf.	
Greys Ferry Bridge—Bulkhead,	City of Phila.,	Solid rock and unprotected bank.		69			4 $\frac{1}{2}$ mi. from mouth of Schuylkill River.
Lot behind Bulkhead,	City of Phila.,	.....		60x200	12,000		
Bulkhead—N. of 49th St.,	Penn Reduction Co.	City of Phila.,	Unprotected rock and bank.		76			4 mi. from mouth of Schuylkill River.
Lot behind Bulkhead,	City of Phila.,	.....		70x200	14,000		
Bartrams Garden—Bulkhead,	City of Phila.,	600' of concrete wall and 717' of river bank unprotected.		1,317			3 $\frac{1}{2}$ mi. from mouth of Schuylkill River.
Lot behind Bulkhead,	City of Phila.,	Concrete wall,		80			3 $\frac{1}{2}$ mi. from mouth of Schuylkill River.
56th St.—Bulkhead,	City of Phila.,	Unprotected bank,		78			3 $\frac{1}{2}$ mi. from mouth of Schuylkill River.
Bulkhead—N. of 58th St.,	Gulf Refining Co.	.....	.....					3 mi. from mouth of Schuylkill River.
58th Street Bulkhead,	City of Phila.,	.....					2 $\frac{1}{2}$ mi. from mouth of Schuylkill River.
N. of Passyunk Ave. Bridge—Bulkhead,	Harry D. Beaston,	.....	Unprotected bank,		100			1 $\frac{1}{2}$ mi. from mouth of Schuylkill River.
Passyunk Ave. Bridge—Bulkhead,	City of Phila.,	.....				
Bulkhead S. of Passyunk Ave. Bridge,	Atlantic Refining Co.	.....	Bank faced with stone.		201			
Mingo Creek Pumping Station—Bulkhead,	City of Phila.,	.....				
Lot behind pumping station,	City of Phila.,	Bank slope stone-faced		.....	204,296		
Cannon Ball Farm—Bulkhead,	City of Phila.,	Unprotected bank,		1,340			3 mi. from mouth of Schuylkill River.
Penrose Ferry Bridge—Bulkhead,	City of Phila.,	.....		40			
Cannon Ball Farm—Bulkhead,	City of Phila.,	.....		1,186			

At the wharves, docks and ferries along the Delaware and Schuylkill Rivers in Philadelphia, about 24,800 men are daily employed in the various pursuits common to shipping and navigation. 6,000 of these employes work along the Schuylkill and 18,800 work along the Delaware River front.

The piers along the Delaware River are numbered in series. One series begins at Market Street and extends southerly. Another series extends from Market Street northerly to Port Richmond. A third series begins at Port Richmond and extends northerly to the city line.

In 1913, the first series comprised 65 piers; the second series 76 piers; and the third series 28 piers, making a total of 169 piers along the Delaware River.

There are 57 hulkheads or wharves along the Schuylkill River, 35 being along the east and 22 along the west bank thereof. The dredging out of various docks near or into which city sewers empty is done by a municipal plant. In addition to the ordinary solids carried by sewage, large quantities of street dirt are brought down by the sewers and deposited into the River, a considerable part of which settles in the docks, but such sedimentary matter, owing to the open pile construction of most of the wharves, is carried for a considerable distance by the constant tidal movements up and down the river from the actual discharging point of the sewers.

The custom of many owners of the wharves has been to permit the filling up of the docks to a depth making it difficult and frequently dangerous to beach in them. The city has to require such dock owners to dredge out the docks to a depth sufficient to properly accommodate vessels desiring to use them. The depth should be enough so that the docks are available continually for the proper and safe berthing of vessels.

3—*The Schuylkill River Channel.*

The Schuylkill River is a most valuable asset of the Port, and, owing to the U. S. Government's policy of refusing aid to streams similar to it, located entirely within the boundary of one municipality, the maintenance of the channel is one of the duties of the city and the State.

In Director Norris's report for 1912 is the following:

"Nearly fifty per cent. (50%) of the gross export tonnage of the port originates on the Schuylkill River, and the channel is deserving of better treatment than it has heretofore received. The rapid shoaling of this channel is believed to be due, not so much to the amount of silt brought down from the upper reaches of the stream and deposited in tide water near its mouth, as to the constant, gradual oozing into the narrow cut of the improved channel of the soft mud composing the bank and the flats on either side of the stream. In connection with the natural expansion of the city the large improved area along this stream would quickly become desirable manufacturing sites if reclaimed from its present marshy condition. The construction of bulkheads along the river, and the pumping behind these bulkheads of the material which is very desirable to remove from the channel, is the most obvious and most economical method of reclaiming these lowlands. The bulkheading of the stream would prevent the running into the channel of the mud along the bank, and would reduce to a minimum the shoaling of the waterway."

The Schuylkill River channel is now in better condition from its mouth to Walnut Street, as regards depth and navigability, than ever before. The ultimate design is for a thirty-foot channel from the entrance as far as Passyunk Avenue, a twenty-six foot channel from this point to Grays Ferry Bridge, and a twenty-foot channel from here to Walnut Street.

At the conclusion of dredging operations in 1913, the following depths obtained in the channel—center line:

Between the entrance and the Back Channel,.....	30 feet.
From Back Channel to Penrose Bridge,	28 feet.
From Penrose Bridge to Passyunk Avenue,	26 feet.
From Passyunk Avenue to Gibson's Point,.....	29 feet.
From Gibson's Point to Harrison's Wharf,.....	21 feet.
From Harrison's Wharf to Walnut Street,.....	18 feet.

The average width of the Schuylkill between bulkheads is now from 500 to 600 feet. To dredge to this width—the entire prism of the pier to the finishing depth—is unnecessary and unwarranted at this time. Property owners desiring to improve their river frontage in cases where the improved channel is not located immediately along shore in front of the bulkhead, are given substantial co-operation by the city, in extending the limit of the necessary dredging—from a full cut of 200 feet in width—so that they may properly utilize their properties. The city will not take the whole burden of such dredging.

Important legislative enactment (1913) hereinbefore referred to, authorized the city to construct bulkheads along properties on the Schuylkill and Delaware Rivers for the maintenance of the channel, and, eventually, to collect the cost from the owners when actual use of the bulkheads is made. The State may aid.

4.—*The Delaware River.*

a—HARBOR CHANNEL.

The thirty-foot U. S. Government channel in the Delaware River extends officially only as far as Christian Street. The official depth of this channel between Christian Street and Allegheny Avenue is only 26 feet, although throughout the entire section, except for a short length in front of A to G piers, the natural channel is several feet deeper than 26 feet. Some of the largest steamers sailing from the Port now land at piers "A to G" (North Wharves, Port Richmond) and leave there with a draft of 28 feet and more.

Although this section of the river comes within the limits of the approved 35-foot channel project, and is within the jurisdiction of the U. S. Government, the city at its own expense has undertaken to afford temporary relief at Port Richmond to these large vessels. The Federal Government work on the 35-foot channel within the Harbor limits was begun in May, 1914. The head of this channel is just above the piers at Allegheny Avenue.

b—SHIP CHANNEL.

The Delaware ship channel during 1912 had a continuous depth of 30 feet along the entire center line for the first time in its history. The 30-foot channel was begun in 1901, and completed in March, 1911, when the original work was finished. In his report for 1912 Director Norris had this to say about the channel:

"During the ten years of its progress, maintenance work, owing to lack of funds, had not kept up with the original dredging, however, and only about two years before the completion of the last of this "original work" surveys made by the U. S. Engineering Department, under whose charge the improvement was, showed a mean depth over several long shoals—supposed to be completed portions of the channel—of only slightly over 23 feet. Since that time the problem of the continuous maintenance of the channel has been given serious attention, and unremitting work on it has made possible the above result of a practicable 30-foot channel from Philadelphia to deep water in Delaware Bay, a distance of about sixty miles.

"The existence of these shoals had been a source of much annoyance to deep-draft steamers, which had been compelled, in order to successfully pass over them, to take advantage of the higher stages of tide in the River, and it frequently required full tides to enable them to get over the shoals, and make the passage between Philadelphia and deep water in the Bay. The necessity for anchoring between shoals, in connection with the procedure, naturally caused serious delays in the passage of vessels, much irritation on the part of passengers and considerable financial loss to the owners."

"This former difficulty of navigating a channel containing shoals with less actual depth by several feet than the theoretical depth of the channel is now eliminated, and the deepest draft vessels using the port can pass from one end of the River to the other without difficulty and in perfect safety. The improvement in buoyage and lighting of the channel has kept pace with that of the dredging, and it can now be said that Philadelphia has one of the best marked, best maintained, easiest navigated and safest channels of any of the world's great ports."

c—UP-RIVER CHANNEL.

The twelve-foot channel between Philadelphia and Trenton is completed as far as the present steamboat wharves at the lower end of Trenton. The work of extending the channel from that point along the Trenton City front as far as the Pennsylvania Railroad stone arch bridge is now in progress by the U. S. Government. Its completion will place Trenton within easy and economical communication with Philadelphia. It will also complete one more link in the chain of inter-coastal waterways which will eventually connect the whole Atlantic Coast from Maine to Florida in one system.

The commerce carried during the fiscal year ending January 30, 1914, as reported by the U. S. Engineers Department, Philadelphia Office, for this Upper Delaware River Section, amounted to 1,869,521 short tons, and consisted principally of coal, dairy and farm products, sand, gravel, stone, brick and general merchandise. The value of all commerce carried was \$8,914,441.

5.—*Municipal Pier Construction.*

a—*Dock Street Pier*—No. 16 South Delaware Wharves—is a modern, concrete and steel steamship pier, 120 feet wide by 580 feet long, built by the city, and opened January 1st, 1914. Two sunken car tracks run down the center of this pier. They connect the Belt Line Railroad, thus affording access to the tracks of all of the trunk lines entering the city. The structure is electrically lighted inside and out, is provided with portable lights for use inside of the ships tied up at the pier, and railroad cars on it, and has an equipment of portable electric winches for use in supplementing the ship winches used for discharging cargo. One side only has been rented. The other is reserved for the use of steamers not provided with regular quarters elsewhere. There are now but few berths available in the harbor at which such visitors can be accommodated. The pier is located at one of the most convenient points in the harbor, and its facilities have been in much demand. It provides a much needed addition to the facilities of the Port. Though not as large as the Department would have chosen, Director Norris says it is of great service in temporarily relieving the pier shortage now becoming so acute. Owing to this scarcity of present wharf accommodations, the South Side will be maintained for the present as an open pier for the accommodation of all comers, in the order of their arrival and application to space. This dearth of pier accommodations along the main Delaware water front is not a good argument to shipping lines to increase their service, and it is thought advisable under existing circumstances not to rent this half of the pier exclusively to any one company or interest,

and thus remove the Department's only vacant berth from the market, but to reserve it for such occasional vessels as may from time to time be unable to find suitable accommodations elsewhere, until the two additional piers are completed, when the present condition of overcrowding will be much relieved."

b—*The Southwark Piers*—Nos. 38 and 40 South Delaware Wharves—are being constructed between Catharine and Christian Streets, each one of which is 180 feet wide and 550 feet long. They are described by Director Norris as follows: "Their foundations will be of piles and concrete, topped off with a concrete slab floor, and surmounted by a two-story steel and concrete warehouse shed, except at the inshore end where a two-story building will be located. Two sunken car tracks will run down the middle of the piers, and the most modern freight handling equipment will be provided on them for the facilitation of cargo movement. Bulkhead sheds will connect the two piers with each other, and with the Philadelphia and Reading Railway Company's pier—No. 36 South Delaware Wharves—located just to the northward of the group. The docks between the piers will be 200 feet wide, which will provide sufficient space for docking two vessels of large size on either side of the dock with room enough between them to accommodate the usual number of lighters, barges, etc., engaged in taking or loading cargo over the side of the ship."

"Pier No. 36 of the Reading Company is not designed for steamship trade, but for the accommodation of car floats, although inasmuch as the style of architecture of the Delaware Avenue front of the structure will be uniform with that of the municipal piers along side of it, the three will present the appearance of one harmonious group. The style is a modified Romanesque handled in a broad, dignified manner, in concrete, with good lines and proportions, but no unnecessary ornamentation, such being considered superfluous and inappropriate in commercial structures of this character. The entire frontage occupied by them will be more than 1,000 feet in length, and the whole group will be by far the most notable water front improvement ever undertaken in Philadelphia." They will have Belt Line Railroad connections, and be provided with the most up to date equipment of every kind for the economical handling of freight and passengers. One of them will be completed during 1915, and the other the following year. Their approximate cost will be \$1,000,000 each.

c—*Delaware Avenue Bulkhead*—Delaware Avenue is the through pier for handling traffic along the water front. That portion of it between Callowhill Street on the north and South Street on the south is 150 feet wide. This part 1.2 miles was widened and opened in the year 1900. The Delaware Avenue bulkhead—wall extension between South and Christian Streets on the south, and Callowhill Street and Fairmount Avenue on the north, is completed and paved to a width of 150 feet. "This improved marginal street extends for a distance of 1.8 miles abreast of the main business section of the City, along the most used portion of the Delaware water front. The congestion of vehicles and railroad traffic on the old street was such as to cause great delay and expense, and some risk, in connecting with the transportation and local distribution of outbound and inbound steamer freight, and the beneficial effect of the improvement will be immediately felt and appreciated by the water front interests.

"Even in the widened sections of the Avenue there is much congestion of teams at times, caused mainly by the large number of these desiring entrance to certain piers, at certain hours, and by the interference of team movement by railroad trains, either in transit or packed on the tracks. It is absolutely impossible to forbid the free movement of trains at all hours on this street without very seriously

object of this marginal avenue, is to serve as an adjunct to the piers, and a means interfering with car service to the piers, which is out of the question, considered from the standpoint of good policy. The principal, and practically the whole of communication between them. Any interference with its free use for this purpose is improper and unfair to the shipping interests. Rigid traffic rules covering both train and vehicular movements on this street are necessary, and pedestrian traffic across the street should be as nearly completely eliminated as possible."

At the foot of Market and Chestnut Streets there are Ferry Crossings. Boat loads of passengers seriously interfere with team and car movement on Delaware Avenue at these crossings. During certain hours the interference is practically constant. For the safety of the pedestrians and the convenience of the wagon and car operations, this pedestrian traffic should be removed entirely from the street, by the possibility of carrying this traffic over the avenue by foot-bridges running from the easterly side of the avenue up Market and Chestnut Streets to the Front Street intersection. The street grades at these two principal points of crossing Delaware Avenue are favorable for such a plan.

6.—*Notable Private Water Front Facilities.*

Perhaps the most noteworthy private water front facilities are those of the Philadelphia and Reading Company at the Port Richmond terminal docks and piers, and those of the Pennsylvania Railroad Company at Girard Point on the Schuylkill River, and at Greenwich Point on the Delaware. At Port Richmond, beginning at the foot of Cumberland Street and extending northerly, are piers Nos. 18 to 1 inclusive and piers A to J inclusive, owned by the Philadelphia and Reading Railway Company. These terminal facilities cover a continuous stretch of about one mile along the Delaware River. They constitute series No. 3, north wharves. 1,700 men are daily employed at the Port Richmond terminal piers. Pier No. 14 of this series is an iron ore dock provided with modern hoisting apparatus. Pier No. 12 is a modern grain elevator. Piers A to D are export piers and are leased by various ocean steamship lines. Piers G to H are for very heavy freight business and any vessel may dock there having business with the company. Pier J is where cars are loaded on to flat boats for transportation in the harbor. The other piers are coal wharves principally. At Girard Point there are two new concrete piers, a new concrete grain elevator of 1,000,000 bushels storage capacity, and two mechanical ore unloaders with a capacity of 6,000 tons per day. At Greenwich Point there is mechanical car dumping apparatus for the quick loading of coal in vessels.

7.—*Belt Line Railroad.*

The Belt Railroad was conceived and undertaken about twenty-five years ago for the development of the Port. Lack of sufficient capital and of the proper spirit of co-operation between it and the other railroad companies has prevented the thorough co-ordinating of the business of the City's water front. The authorities of the road have not operated cars over it. In fact there is no equipment belonging to the Road, and the tracks are insufficient in length to connect the various working parts of the water front with each other.

Director Norris thinks the Belt Line Railroad should be in the hands of the general port administration, of which it must necessarily be an important, and indeed an essential part. But, in any event, its management, he thinks—should

be independent of and superior to the necessity of operating merely by the grace of the trunk line railroads as at present. This means a complete system of tracks, car storage yards and locomotives for the physical handling of Belt Line trains independent of the railroads contributory to the movement.

Early in the year 1914, a plan was agreed upon by the City, the Belt Line Railroad Company, the Pennsylvania and the Baltimore and Ohio Railroad Companies for the extension of the Belt Line Railroad service, and for the abolition of all grade crossings in South Philadelphia, except on Delaware Avenue, where it is impracticable for the present, and for a short distance on Washington Avenue; the relocation of the lines of the three railroads; the establishment of large car storage and classification yards and steamship terminals by the Pennsylvania and Belt Line Companies between Greenwich Point and the Navy Yard reservation at League Island; the erection of new piers, the incidental extension widening and paving of Delaware Avenue, southward from its present physical terminus at Christian Street to the said yards at Greenwich Point; and for the readjustment of tracks on this street. Before June 30, 1914, contracts were let and work was in progress. A more detailed explanation of this vast improvement is given hereinafter.

About this enormous project Director Norris has the following to say in his 1913 report:

"Belt Line Railroad facilities are guaranteed under the agreement to every wharf on the South Philadelphia water front, and the debilitating effect of the monopolizing of railroad service on piers by one line of railroad only is forever eliminated as a factor in restricting the trade of the Port. One of Philadelphia's most telling arguments and inducements to prospective new entries in the field of steamship service to their Port, has been the existence along the central portion of the river front of a free field for railroad competitors, all the piers between Callowhill and Queen Streets being able to obtain freight service from any one of the great trunk line railroads coming into the City. The new agreement extends this Belt Line service over three miles more of water front. This guaranty of equal service to all piers by all the railroads is one of the strongest safeguards against the possibility of improper attempts at the domination and restriction of water commerce by any one or two interests, however powerful."

"The former development of this section (South Philadelphia) has been in a casual, haphazard manner in pursuance of a hand-to-mouth policy of providing improvements for the needs of the moment, and not much longer. Streets which should be important avenues of traffic are now occupied by surface lines of railroad tracks to the practical exclusion of proper vehicular traffic on them; a considerable portion of the city is blocked off for development by the presence of surface tracks running across town, practically from river to river; a large section of the water front is occupied by these companies, but with such indifferent improvements and facilities, that they are satisfactory neither to the railroad, the city government, nor the public. The new agreement provides a practicable working plan, acceptable, after various compromises, to all interests, under which an extensive and economical utilization of the entire capacity of the water front of this section can be made. In short, by it, order has been established out of chaos."

III. COMPREHENSIVE POLICY FOR PORT IMPROVEMENT.

PROJECTED IMPROVEMENTS—CITY DEPARTMENT OF WHARVES, DOCKS AND FERRIES.

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III. COMPREHENSIVE POLICY FOR PORT DEVELOPMENT.

PROJECTED IMPROVEMENTS — CITY DEPARTMENT OF WHARVES, DOCKS AND FERRIES.

1.—*Need of Increased Facilities.*

The acute necessity for increasing the facilities of the port for handling commerce, has been partially demonstrated in the foregoing presentation of facts and reasoning therefrom. The port is not in a position to offer adequate accommodations for new steamship lines, or for the expansion of existing services. This lack of proper facilities discounts any business campaign that might otherwise be substantially entered into for the radical enlargement of the port business. Director Norris' appeal puts the issue clearly. He said: "The increase in the amount of shipping seeking accommodation in the ports of the Atlantic Coast is inevitably going to be large within the next few years. In the first place, the normal growth of the country and the consequent increase in overseas trade must have accommodations provided for it; secondly, the opening of the Panama Canal, while its precise result is impossible to forecast, will undoubtedly enormously stimulate the interchange of commodities between the Atlantic and Pacific States by sea, the coal and manufactured products of the East being sent westward, and the fruit, oil and lumber of the west being returned in exchange, and thirdly, owing to the fact that the shipping facilities of New York Harbor is as much, if not more, behind the times than other cities in affording the necessary pier accommodations to take care of it, much of the trade formerly going to that port, as a matter of habit, will be seeking other outlets wherever offered."

"This is realized by the New York authorities, as well as those of other ports, and the most tremendous efforts will be made on their part to retain, as heretofore, the lion's share of not only the old, but also the new commerce. That this condition is apparent to practically all of the Port authorities on the Atlantic Coast is evident, and all of them are preparing to fight for this trade to their fullest ability. Boston and Baltimore, our nearest ports and keenest rivals, are fully awake to the situation, and Philadelphia must not only realize it, but must take proper and immediate steps to take full advantage of this rare opportunity."

"That Philadelphia's natural and artificial advantages are not only unexcelled; but approached, by either Boston or Baltimore, hardly admits of controversy. Located on an excellent deep water channel, with a large producing and convenient territory tributary to it, with direct connections to three independent trunk line railroads, Philadelphia's facilities for securing and accommodating a large commerce are of the very first rank. New York offers some questionable advantages to those steamship lines conveying goods destined for consumption by the enormous population composing her metropolitan district, which insures her permanent control of this branch of trade. The transatlantic passenger express traffic is also largely in her hands, and is likely to so remain for several very good and very natural reasons. As far as her facilities for economical handling of goods intended for trans-shipment into the Mississippi Valley and Western States is concerned, however, she cannot now, and never can, compare with Philadelphia, except with the assistance of discriminatory freight rates. The fact that by far the largest number of her wharves are located on the wrong side of the Hudson and East Rivers places upon goods landed at these wharves an extra handling cost so

large that nothing but the assistance of the railroad and steamship lines with unfair freight rates discriminations can enable New York to compete with Philadelphia in this trade. The incidental lighterage charges, to which all of the steamship freight handled in that city is subject, are alone enough to impose a handicap on her commerce sufficiently powerful to enable her rivals to obtain their rightful share, were the fact but realized and acted upon by them."

"In none of these three cities, New York, Boston and Baltimore, is the configuration of the shores surrounding their harbor of such a character as to permit of the same perfect co-ordination between the steamship terminals and the railroads that would be so easy of navigation here in Philadelphia with a little effort on our part."

"The time is ripe for Philadelphia to reassert itself and again take to its old-time place as one of the world's foremost ports. That it is in no position to do so until its docking and railroad facilities are enormously increased needs no argument to any outside mind. Cities, in so far as their piers are concerned, are exactly in the position of landlords of public houses. Such a landlord must needs have accommodations to offer before he can expect to draw trade. His would-be guests cannot deal with him on the basis of future promises, and before he can reasonably ask their patronage he must complete his preparations for housing and feeding them, and be ready to show his accommodations, and demonstrate his ability to administer them. In exactly similar manner a Port desiring to extend its old business and draw new to it cannot deal in vague generalities and promises of possible future accommodations for taking care of it, but must build its piers, its warehouses and railroad connections, and be prepared to make offers of definite service to inquiring steamship companies, instead of indefinite offers based upon hypothetical improvements."

"The City of Philadelphia is now standing face to face with a great opportunity. If it advances to meet it with a rational program of actual accomplishment it can be grasped, to the city's everlasting credit. If it enters upon the campaign with hesitant faith and faltering steps it will meet with nothing but rebuff and failure—and rightly so."

2—*The General Scheme of Development.*

In a number of sections of the present built-up water front of the city, sites are obtainable at reasonable prices, and are suitable in other respects for development. Located in the comparatively central section between Washington Avenue on the south and Columbia Avenue on the north, there are sites for the construction of single piers or small groups of piers of moderate size, for the use of either river or bay or coastwise or ocean freight purposes. According to the general scheme adopted by the city, the first move for the development of the port has been to acquire some of these sites—Dock and Southwark improvements. The second logical move is the gradual extension southward of a comprehensive system of long, wide piers, with adequate car storage yards and other railroad facilities, commencing at Moore Street and extending to the Greenwich piers. This plan keeps actual present conditions in view, and provides for logical expansion. The improvements so far suggested would adequately care for Philadelphia's probable growth of commerce for some time. The section is convenient to railroad connections and trolley lines and for local distribution of freight by truck.

After these facilities are utilized fully, the development of the lower region of the Delaware River front below Greenwich Point and along the lower Schuylkill can be undertaken. To take up these outlying sections first, to the neglect of the obviously far better pier sites nearer the central city, appeared to the Department to be out of the question.

3—*Southwark Piers.*

In keeping with the comprehensive policy outlined, the Southwark piers have been located on the Delaware River front near Christian Street as heretofore described.

4—*Penn Treaty Pier.*

A single pier is projected on the Delaware River front between Columbia Avenue and Palmer Street,—North Wharves. The location is in the heart of a manufacturing district. No wharf capable of accommodating ocean steamers is found for a distance of over a mile on either side. The land is wide, and of such universal depth that it has been planned to locate a series of open-air markets on the plaza between the end of the wharf and Beach Street, upon which the property fronts. The pier is to be 120 feet by 500 feet, of a permanent type of construction, with pile and concrete substruction, surmounted by a two-story shed, equipped with railroad tracks, etc. The market sheds in front of the piers are to be open-sided. The project is estimated to cost \$500,000.

5.—*Moyamensing Improvement.*

The established bulkhead and pierhead lines in the central section of the city fixes and limits the length of the piers to about 550 feet. A pier 1,000 feet long takes up no more bulkhead river than one 500 feet long, and naturally furnishes berthing space for twice as many vessels. All of the present city piers are too contracted in width. Future piers should be not less than 250 feet wide.

The proposed improvement next in chronological order is a group of long, wider piers, to be known as the Moyamensing Improvement, the name being that of the old district of the city in which they are located. There will be ten piers, the first one located at McKean Street and the group extending from that point down to Hoyt street, including the site of the present coal terminals of the Pennsylvania Railroad and Greenwich Point. On the property vacated by the Railroads and some additional frontage of now wholly unused privately-owned property, the ten proposed city piers will be located. These will be of considerably greater size than any now constructed in Philadelphia, it being recognized that the modern cargo-carrying steamer, with an enormously increased freight capacity over those of but a few years back, absolutely requires much greater wharf space.

The new piers will range in length from 900 to 1200 feet and in width from 250 to 300 feet, with docks between them of approximately the same width. The first pier at McKean Street will be 250 feet wider and 900 feet longer—the smallest of the series. The money is in hand for starting this pier. The others are expected to follow as needed from year to year, consistent with the port development. Each pier will be two stories in height, provided with electric lighting and mechanical freight handling equipment, and will afford berthing space for four steamers at one time. Sunken car tracks will run out on the pier for its whole length and ample car storage space will be provided outside of the piers between its entrance and Delaware Avenue to guarantee prompt shifting service of cargo in and out.

"The lack of car storage space near piers is one of the great deficiencies of the present, and makes impossible the rapid discharge and loading of cargo from and to vessels on account of the extreme difficulty, with the present inadequate trackage facilities, of having shifts of cars made in and out of piers as often as desired. The capacity of the standard freight car is only forty or at most fifty tons, and half of this amount, say twenty to twenty-five tons may conservatively be assumed

as the average car load of freight as actually carried. About one-half of the freight received on Philadelphia wharves from over-seas is trans-shipped inland, so that it can readily be seen that literally hundreds of cars are needed to accommodate the freight from only one steamer of fair size carrying from 5,000 to 10,000 tons of cargo. This, of course, necessitates a number of complete changes of cars per day for an active pier, and clearly points out the necessity for commodious car yards as among the immediate adjuncts of steamship terminal piers."

This is why the Director thinks that preferably the movement of these cars should be under the charge of the same management as the water front operations themselves, as they are an essential part of them, or at least under a management independent of control by any one railroad company. Each of the ten big piers is estimated with its equipment to cost \$1,500,000 including property.

6.—*League Island Municipal Docks.*

Between the end of the Moyamensing group, which extends to the present Point House Wharf of the Pennsylvania Railroad Company, and the upper end of the Navy Yard reservation at League Island, ample space is left along the water front opposite the point, freight and car yards of the railroads for construction of such steamship and car float wharves, coaling trestles, and other water front facilities as may be needed by them.

A proposition has been submitted by Director Norris to the Navy Department for the construction of the League Island Municipal Docks, to be located to the southward of these railroad wharves on the Beach Channel in the rear of League Island between Broad Street and the Delaware River. This will be on the north shore of the Channel in the neglected section of the Navy Yard between this inlet and Governor Avenue, which street will mark the boundary of the joint freight yard.

"The improvement proposed is along very simple lines, consisting merely of the formation of a channel of sufficient width and depth for modern steamers by straightening, widening and deepening the present tortuous Back Channel, the construction of a long, substantial concrete quay wall, and on the land back of this wall the erection of a long row of storage warehouses. These sheds will be flanked on both sides by railroad tracks and loading platforms, and served by a number of electric traveling cranes located between the houses and the edge of the quay wall end used for transferring freight to and from the ships and sheds along the quay. This improvement will be very similar in appearance to many European developments, and is the natural and obvious plan to use in this particular locality. About 6,000 feet of quay can be constructed within the limits of the reservation, and considering the large berthing space provided by it, the estimated cost of the entire project, about \$1,000,000, is very low. The close proximity of the largest railroad yards in the city would give it unusual facilities for the economical handling of bulk freight intended for inland points of destination, and its nearness to the industrial factory section, which it is expected will develop just to the northward of these yards would be a great advantage. As director Norris has put it, "The Navy Yard property was presented by the city of Philadelphia to the U. S. Government in 1868. Less than one-third of its more than 900 acres is now occupied by the Navy establishment, and the portion of the yard proposed to be utilized for the above dock has never been used or occupied for any purpose whatever during the history of the Yard, and probably would not be in the natural course of events for many, many years, if ever. It would be so manifestly to the advantage

of the Navy that the city should build this splendid steamship and railroad terminal right at its door, available as it would be, in case of war, as an invaluable addition to the Yard's wharfage and shipping facilities for fitting out and coaling vessels of war, transports, colliers, etc., that no difficulty should be experienced in obtaining the consent of the Government to transfer back to the city's guardianship the small area of land involved, something less than 40 acres of space, or about 4% of its total area."

PROJECTED IMPROVEMENTS—SOUTH PHILADELPHIA, CITY DEPARTMENT OF PUBLIC WORKS.

The proposed engineering works in South Philadelphia, involved in changes in Public Highways, Railroad Facilities, Docks and Piers, as set forth in the agreement authorized by ordinance of the Select and Common Councils of the City of Philadelphia, were approved by the Mayor February 14th, 1914, and a Certificate of Public Convenience therefor was later issued by the Public Service Commission of the Commonwealth of Pennsylvania.

1.—The Vital Object of The Proposed Changes.

The plans, comprised in the said agreement, contemplate in their ultimate entirety the utilization of the Delaware River front, and the Schuylkill River front as a water terminal for general commercial purposes, in order that Philadelphia may become as great a factor in the world's trade as other inland ports.

The City Department of Wharves, Docks and Ferries is planning the construction of a number of municipal piers, each pier to be twelve hundred (1200) feet long by three hundred (300) feet wide, with docks between of the same width as the piers and with railroad tracks along the end of the piers, adjacent to the bulkheads,, and paralleling the great public thoroughfare named Delaware Avenue.

West of said Avenue sites for storage warehouses are planned and back of them a factory section is laid out, where manufactories using large quantities of imported raw material, may be established to advantage. Beyond this the section is planned for residential up-building and general development.

The consummation of this project will mean the most extensive, complete and modern steamship and railroad terminal in the world. The work must be done gradually; first, because of its magnitude and cost; and second, because after the first fundamental changes shall have been made, the utilization of the facilities afforded must determine the manner and time of making extension.

To make the primary changes provided for in the said agreement of February, 1914, will require five years. Furthermore, even this start, involves an outlay of \$20,000,000.

2.—The Extent of City Territory Embraced by the Proposed Changes.

The South Philadelphia territory to be covered by the projected improvements is about 3 miles long and upwards of 3 miles wide. It is bounded on the east by the Delaware River, on the west by the Schuylkill River, and on the south by the Philadelphia navy yard, which is on League Island in the Delaware River.

From the northern boundary of said district (Christian Street) southerly, for a mile and a half, the territory is closely built up and densely inhabited—excepting the westerly section. Real estate development operations have ceased abruptly at Oregon Avenue. This highway extends east and west across the peninsula. South of Oregon Avenue the land is undeveloped for municipal purposes and much of it is subject to tidal overflow, or would be if it were not for dykes and tide gates.

Midway of the peninsula, and extending north and south, is the thoroughfare known as Broad Street. From Oregon Avenue to the navy yard, this street is now being built by the city as a boulevard with special parkway treatment. The southern section of Broad Street passes through League Island Park, which is also an extensive city project in process of construction.

3.—*Existing Railroad Facilities in South Philadelphia.*

Three railroad companies are involved in the South Philadelphia project; namely, the Pennsylvania Railroad Company, the Baltimore and Ohio Railroad Company, and the Philadelphia Belt Line Railroad Company.

a—THE BELT LINE COMPANY.

The Belt Line Company, although legally a corporation for profit, is in fact a corporation created and existing in the public interest. It is fostered by the city, the trade organizations control a majority of the stock, the company has no capital, does not build or operate facilities, but owns a franchise route along the Delaware River front and about one-third of the way up the Schuylkill River front. It simply leases transportation right to any railroad company desiring river front facilities. The intent in creating this company was to prevent a monopoly. It has by contract permitted a portion of its route along the Delaware in South Philadelphia to be used by the so-called Delaware Extension of the Pennsylvania Railroad, and by the Baltimore and Ohio Railroad, under terms providing for interchange of traffic.

b—THE PENNSYLVANIA COMPANIES.

1-b—(*Washington Avenue Branch*).

The Pennsylvania Railroad lines enter South Philadelphia from the west, being bridged over the Schuylkill River at two points near the northern boundary of the district.

The old Philadelphia, Baltimore and Washington Railroad—now known as the Washington Avenue Branch—crosses the Schuylkill River immediately south of Gray's Ferry Avenue bridge and extends along its own right-of-way south of and adjacent to the said avenue to Washington Avenue, a distance of about 1 mile, crossing in this length, 17 public highways, all at grade, and the Baltimore and Ohio Railroad, the latter being in tunnel; thence after crossing at grade the Delaware extension of the Pennsylvania Railroad, it extends easterly in Washington Avenue across the city to Delaware Avenue, a distance of 2 1-3 miles, crossing in this length 30 public highways, all at grade.

At the Broad Street crossing, where formerly was located the old P. B. & W. passenger station, is now located a freight station. East and west of Broad Street in said avenue there are storage tracks. Also along Gray's Ferry Avenue, in the neighborhood of 29th and 30th Streets, there is a storage yard on land owned by the company. Furthermore, for nearly one-half a mile along the Delaware River, at the foot of Washington Avenue, the company has extensive yards, docks and piers.

2-b—(*Delaware Extension*.)

The so-called Delaware Extension of the Pennsylvania Railroad crosses the Schuylkill River opposite Christian Street, via the Arsenal Bridge, this bridge having been built high (some 10 years ago) in anticipation of an elevation of the railroad lines in South Philadelphia; thence it descends to the grade of Gray's Ferry Avenue and Washington Avenue in a distance of less than 2000 feet; thence passing southerly along 25th Street and across the Baltimore and Ohio Railroad tracks, a total

distance of about 2 miles, it crosses 8 public highways, all at grade, the last one being Passyunk Avenue, making 10 street crossings to this point; thence it extends easterly in a straight line along the company right-of-way to the Pennsylvania Company's piers at Greenwich Point on the Delaware River, where the company has extensive land holdings and terminal facilities. Along this easterly stretch of 3 miles of main running track, 4 public highways are crossed, all at grade. Extensive freight classification yards abut the line. The land is unimproved adjoining the tracks. Thence the Delaware Extension passes northerly in Swanson Street and in Delaware Avenue, a distance of $1\frac{3}{4}$ miles to Washington Avenue and the yards and piers of the Pennsylvania Company lying between Reed Street and Queen Street; thence the said Delaware Extension tracks are laid northerly in Delaware Avenue by agreement with the said Belt Line Company.

Along the lines of the Delaware Extension between Greenwich Point and Washington Avenue, 15 streets are crossed, all at grade.

3-b—(*Girard Point Branch*).

The Girard Point Branch of the Delaware Extension, begins at the South end of the 25th Street line, near Bigler Street, and pursues a circuitous course to the west and south, terminating south of Penrose Avenue at the Girard Point Storage Company's yards, piers and grain elevators on the Schuylkill River, the length of this branch being approximately 1 1-3 miles, along which 3 highways are crossed, all at grade.

4-b—(*Schuylkill River Branch*.)

The Schuylkill River Branch extension is a prolongation of the Girard Point Branch easterly to Broad Street and the Philadelphia navy yard, a distance of $1\frac{1}{2}$ miles, in which 1 street only is crossed and that at grade.

Excluding Delaware Avenue and Swanson Street, where changes do not involve the abolition of grade crossings, it appears that the Pennsylvania Railroad Companies maintain 67 grade crossings of highways in South Philadelphia.

c—THE BALTIMORE AND OHIO COMPANIES.

1-c—(*Schuylkill River East Side Railroad*.)

The Baltimore and Ohio Railroad also enters South Philadelphia in the northwest corner of the district, crossing the Schuylkill River 2000 feet downstream from the Philadelphia, Baltimore and Washington River bridge, and extending northerly under Schuylkill Avenue and Wharton Street and by tunnel under Gray's Ferry Avenue and the tracks of the P. B. & W. Railroad, and along the river under the tracks of the Delaware Extension near Christian Street to the main passenger station near Market Street, in the centre of the city.

The said B. & O. Company owns property abutting the Schuylkill River, beginning at its said river bridge and extending southerly for 3-5 of a mile. The land is utilized for yards and repair shops. From these yards there is a main running line, known as the Schuylkill River East Side Railroad, which extends easterly along the bed of Wolf Street (not physically opened) for a distance of over a mile and, crossing the tracks of the Delaware Extension, turns southerly and extends in 23rd Street for one-third of a mile; thence easterly in Oregon Avenue and thence northerly in said street and avenue to the yards, piers and terminal facilities of the Baltimore and Ohio Company, in the vicinity of Snyder Avenue. This branch up to Vandalia Street crosses 8 highways, all at grade.

Thence the tracks continue northerly from Snyder Avenue up to Delaware Avenue and Vandalia Street for 3-5 of a mile or more to other yards, piers and terminal facilities of the Baltimore and Ohio Company along the river between Tasker and Dickinson Streets, there being a belt line connection at this point between Vandalia Street and Swanson Street.

Along the lines of the B. & O. Company in Vandalia Street and Delaware Avenue 10 streets are crossed, all at grade. Excluding these crossings, because the proposed changes do not involve their abolition, it appears that the Baltimore and Ohio Company maintains 8 grade crossings of highways in South Philadelphia.

4—Tabular Statement of Existing Crossings of Railroads and Public Highways in South Philadelphia.

TABULAR STATEMENT.

Number.	Public highway.	Trolley tracks.	Mode of Protection.			Proposed changes.
			Gates.	Flagman.	Stationed flagman.	
PENNSYLVANIA COMPANIES. (Washington Ave. Br.)						
1	S. 36th St.,			Yes		None
2	Harmony St.,			Yes		None
3	S. 36th St.,				No	None
4	Sedwyck St.,				No	None
5	S. 34th St.,				No	None
6	S. 33d St.,		Yes			None
7	S. 32d St.,			Yes		None
8	Patton St.,				No	None
9	Napa St.,				No	None
10	S. 31st St.,		Yes			None
11	S. 30th St.,			Yes		None
12	S. 28th St.,		Yes			Underpass
13	Federal St.,		Yes			Underpass
14	Annin St.,				No	Underpass
15	Ellsworth St.,			Yes		Underpass
16	S. 27th St.,			Yes		Underpass
17	S. 26th St.,			Yes		Underpass
18	S. 25th St.,				No	Underpass
19	S. 24th St.,			Yes		Underpass
20	S. 23d St.,	Single	Yes			Underpass
21	S. 22d St.,	Single	Yes			Underpass
22	S. 21st St.,		Yes			Underpass
23	S. 20th St.,	Single	Yes			Underpass
24	S. 19th St.,	Single	Yes			Underpass
25	S. 18th St.,	Single	Yes			Underpass
26	S. 17th St.,	Single	Yes			Underpass
27	S. 16th St.,	Single	Yes			Underpass
28	S. 15th St.,	Single	Yes			Underpass
29	S. Broad St.,				No	Underpass
30	S. 13th St.,	Single			No	Underpass
31	S. 12th St.,	Single			No	Underpass
32	S. 11th St.,	Single			No	Underpass
33	S. 10th St.,	Single			No	Underpass
34	S. 9th St.,	Single			No	Underpass
35	S. 8th St.,	Single			No	Underpass
36	Passyunk Ave.,	Single			No	Underpass
37	S. 7th St.,	Single			No	Underpass
38	S. 6th St.,	Single			No	Underpass
39	Randolph St.,				No	Vacated
40	S. 5th St.,	Single			No	None
41	S. 4th St.,	Single			No	None
42	S. 3d St.,	Single		Yes		None
43	Moyamensing Ave.,				No	None
44	S. 2d St.,	Single		Yes		None
45	Front St.,				No	None
46	Water St.,				No	Vacated
47	Swanson St.,			Yes		None
		21	13	11	23	

TABULAR STATEMENT—Continued.

Number.	Public highway.	Trolley tracks.	Mode of Protection.			Proposed changes.
			Gates.	Flagman.	Stationed flagman.	
PENNSYLVANIA COMPANIES.						
(Delaware Extension.)						
48	Gray's Ferry,	Double	Yes	.....	.....	Underpass
49	Washington Ave., .....	.....	.....	.....	No	Underpass
50	Ellsworth St.,	Single	Yes	.....	.....	Underpass
51	Federal St., .....	.....	Yes	.....	.....	Underpass
52	Wharton St.,	Single	Yes	.....	.....	Underpass
53	Dickinson St., .....	.....	Yes	.....	.....	Underpass
54	Tasker St.,	Single	Yes	.....	.....	Underpass
55	Morris St.,	Single	Yes	.....	.....	Underpass
56	Pt. Breeze Ave.,	Double	Yes	.....	.....	Underpass
57	Passyunk Ave.,	Double	Yes	.....	.....	R. R. Vacated
58	Penrose Ave., .....	.....	.....	Yes	.....	R. R. Vacated
59	Moyamensing Ave.,	Double	Yes	.....	.....	R. R. Vacated
60	League I. Rd., .....	.....	.....	.....	No	R. R. Vacated
61	Stonehouse Rd., .....	.....	.....	.....	No	R. R. Vacated
14		8	10	1	3	
(Branch to U. G. I.)						
62	S. 28th St., .....	.....	.....	Yes	.....	Underpass
63	Jackson St., .....	.....	.....	Yes	.....	Underpass
2				2		
(Girard Point Branch.)						
64	Puddlehole L., .....	.....	.....	.....	No	R. R. Vacated
65	Magazine L., .....	.....	.....	.....	No	R. R. Vacated
66	Penrose Ave.,	Double	Yes	.....	.....	Underpass
3		1	1		2	
(Schuylkill River Extension Branch.)						
67	S. Broad St.,	Double	.....	.....	No	Overpass
1		1			1	
(Swanson St. and Delaware Ave. Branch from Greenwich Point to Washington Ave.)						
Swanson St.						
68	Wolf St., .....	.....	.....	Yes	.....	None
69	Jackson St., .....	.....	.....	.....	No	None
70	Snyder Ave., .....	.....	.....	Yes	.....	None
71	Mifflin St., .....	.....	.....	Yes	.....	None
72	Moore St., .....	.....	.....	.....	No	None
73	Morris St., .....	.....	.....	Yes	.....	None
74	Tasker St., .....	.....	Yes	.....	.....	None
75	Dickinson St., .....	.....	Yes	.....	.....	None
76	Reed St., .....	.....	Yes	.....	.....	None
77	Ellsworth St., .....	.....	.....	Yes	.....	Vacated
Delaware Ave.						
78	Greenwich Pt., .....	.....	.....	.....	No	R. R. Relocated
79	Weccacoe Ave., .....	.....	.....	.....	No	R. R. Relocated
80	Snyder Ave., .....	.....	.....	.....	No	None
81	Mifflin St., .....	.....	.....	Yes	.....	None
82	Morris St., .....	.....	.....	Yes	.....	None
15			3	7	5	

TABULAR STATEMENT—Continued.

Number.	Public highway.	Trolley tracks.	Mode of Protection.			Proposed changes.
			Gates.	Flagman.	Stationed flagman.	
BALTIMORE AND OHIO COMPANIES.						
(Schuylkill River East Side Branch.)						
Main Line to Vandalia						
83	S. 28th St.,	Double	Yes	Yes	.....	R. R. Vacated
84	Passyunk Ave., .....			.....	.....	R. R. Vacated
85	Penrose Ave.,			No	.....	R. R. Vacated
86	S. 20th St.,	Double	Yes	No	.....	R. R. Vacated
87	Moyamensing Ave., .....			.....	.....	R. R. Vacated
88	S. Broad St., .....			.....	.....	R. R. Vacated
89	League I. Rd.,	Double	Yes	No	.....	R. R. Vacated
90	Stonehouse L.,			No	.....	R. R. Vacated
8		3	3	1	4	
Vandalia St.						
91	Wolf St.,				No	None
92	Weccacoe Ave.,				No	None
93	Snyder Ave.,				No	None
94	Mifflin St.,			Yes	.....	None
95	Morris St.,			Yes	.....	None
96	Tasker St.,			Yes	.....	None
97	Dickinson St.,				No	None
98	Reed St.,				No	None
8				3	5	
Delaware Ave.						
99	Snyder Ave.,				No	R. R. Relocated
100	Mifflin St.,			Yes	.....	None
2				1	1	

There is a total of 100 crossings at grade of highways and railroads in South Philadelphia. Thirty-four of these highway crossings have trolley tracks in them. At 44 of the crossings there is no safety device used or protection afforded such as gates or a watchman. At 30 of the crossings, gates are provided and at 26 of the crossings a flagman is stationed. The Pennsylvania Companies maintain 82 of the crossings, and the Baltimore Companies the remainder.

In the Delaware River zone, including the piers, yards and terminal facilities and the industrial plants where it is not contemplated to abolish grade crossings for obvious reasons, there are, excluding numerous switches on to piers, warehouses and industrial works and freight yards, 25 main highway grade crossings, of which the Pennsylvania Companies maintain 15 and the Baltimore and Ohio Companies the remainder. In this zone there are no trolley tracks crossing the railroads. But three of these crossings are now protected by gates; 11 of them have a flagman, and 11 are unprotected.

5—The General Plan of Improvements.

Briefly, the comprehensive plan comprises the building of a Joint Belt Line Railroad along the water boundaries of South Philadelphia, and the abandonment by the railroad companies of all the tracks, lands and facilities inside of this Belt Line zone.

In connection with such readjustment of the railroad line a revision of the lines and grades of streets throughout the unimproved area lying between the two rivers, is contemplated. This will provide better opportunities for transportation and development of the territory for commercial, industrial and residential purposes, and assures wide streets, plenty of diagonals, large house lots and the setting aside at proper distances of small parks and play-ground areas.

Furthermore, to aid in carrying out the city's plans for the improvement of the Port, the Baltimore and Ohio Company will give up its Snyder Avenue yards and terminal facilities, and the Pennsylvania Railroad will give up its Greenwich Point yards, plant and terminal facilities; and as a substitute therefor, the project provides for new terminal yards and facilities to be built along the Delaware River adjacent to the navy yard.

The city will acquire the said Baltimore and Ohio property at Snyder Avenue, including about 900 feet river frontage, and also the Pennsylvania Companies' property at the Greenwich terminals, including about 2500 feet of river frontage. With these and the intervening land along the Delaware River, easy of acquisition by the city, there will be a total distance of 7200 feet available for a symmetrical, economical and efficient municipal steamship terminal development requisite for the proper handling of the enormous cargoes carried by modern ocean freighters, and for the prompt dispatch of cargo to and from the wharves.

a—THE PENNSYLVANIA RAILROAD CHANGES.

1-a—(*Washington Avenue Branch.*)

The proposed changes of the Washington Avenue Branch, as provided for in the said agreement, are briefly as follows:

No change is to be made for the present in the existing tracks along Gray's Ferry Avenue from the Schuylkill River to 30th Street. Hence, 11 street crossings will be continued at grade. Ultimately they will be abolished as grade crossings.

From 31st Street to 25th Street, along Gray's Ferry Avenue, the railroad will continue to occupy its present location, but it is to be reconstructed as a two-track elevated railroad on a new grade over all intersecting streets; thence from 25th Street to 6th Street, said branch is to be reconstructed as an elevated railroad along Washington Avenue, with 3 tracks to 17th Street and then 2 tracks to 6th Street, on a new grade over all intersecting streets. The 27 existing highway crossings along said track elevation are to be continued, but the railroad is to pass over them with a clear head room of at least 14 feet. Thence by 2 tracks on earth embankment filled between retaining walls, the new railroad will descend to grade with tracks (present or revised) on Washington Avenue near 5th Street and thence easterly as a surface line to Delaware Avenue. In this distance, 2 highway grade crossings are to be vacated and 7 highway grade crossings are to be permanently continued. The following is a crossing summary for the Washington Avenue Branch:

WASHINGTON AVENUE BRANCH.

Grade crossings to be abolished	
by street vacation,	2
by railroad passing over,	27
Grade crossings to remain at grade	
for the present,	11
permanently,	7
Total existing grade crossings,	47
Grade crossings to be abolished	
now,	29
in future,	11
Total to be abolished,	40
Permanent grade crossings,	7
	47

A storage yard on Washington Avenue between 18th and 19th Streets is provided to replace the storage facilities now in and along Washington Avenue. Likewise, enlarged storage and delivery yards and facilities are to be provided between Reed Street and Washington Avenue and between Front Street and the Delaware River. These 4 highways are to be widened and improved. In the territory so bounded all other streets are to be vacated.

The present freight station on Broad Street is to be elevated to the same grade as the new tracks and is to be provided with inclined driveways from the street to the reconstructed carload delivery yard.

2-a—(*Delaware Extension Branch.*)

The Delaware Extension will continue to occupy its present location from the Arsenal Bridge at the Schuylkill River to Point Breeze Avenue. This line is to be reconstructed as a two-track elevated railroad on earthen embankment, between retaining walls from said River to Washington Avenue and thence by an elevated viaduct, of metal, concrete or masonry construction, along 25th Street as widened and improved, to the north side of Point Breeze Avenue. Up to this point there are 9 existing highways crossing the railroad; they will become underpasses, and in addition there are 6 other streets which are paved and curbed, and built up to the railroad or near it, that will be physically opened under the elevated railroad. They are Manton, Oakford, Reed, Moore, Mifflin and McKean Streets.

From Point Breeze Avenue onward, the present location of the tracks is to be abandoned. The new line as a two-track elevated structure is to extend along Point Breeze Avenue, as widened and improved, to Vare, Wolf and 29th Street intersection. In this distance there are 2 highway grade crossings. They will pass under the railroad, and in addition 3 new highway grade crossings will be opened under, namely: 26th Street and Snyder Avenue, 27th Street, and Vare Avenue and 29th Street.

From said intersection, the said elevated two-track railroad will continue; but on an earthen embankment and right-of-way adjacent to and west of 29th Street, as revised, (and alongside a similar two-track structure to be built by the B. & O. Company), to Passyunk Avenue; thence as a four-track elevated joint line, (the two easterly tracks for the P. R. R. Co., and the two westerly tracks for the B. & O. Company), in and along 29th Street as it is to be laid out, widened and improved, to Magazine Lane, where the right-of-way for the Philadelphia Belt Line double track begins.

Beyond Magazine Lane, the right-of-way is made wide enough for 6 tracks—2 for the Penna. Company, 2 for the B. & O. Company and 2 for the Philadelphia Belt Line Company. A joint elevated four-track line, with right-of-way for 2 additional tracks, is to be built south of Magazine Lane to Penrose Avenue, on land adjacent to and west of 29th Street. The construction, probably will be earthen embankment; thence the same kind of an elevated structure will extend eastward on property of the Girard Point Storage Company (subsidiary to the Pennsylvania Company) to 26th Street as proposed; thence as a six-track incline through League Island Park and under Broad Street to a connection with the new terminal railroad yard.

Along this elevated line, from Point Breeze Avenue, there are the following streets to be passed over by the new railroad: Passyunk Avenue, Oregon Avenue, Magazine Lane, Penrose Avenue and Broad Street. In addition, the following streets will be opened and passed under the said elevated structure: Pollock, Hoyt, Unnamed, Pennypacker, Beaver and 26th Streets.

The new railroad is to be of such an elevation throughout as to give not less than 14 feet clearance above grade of all intersecting streets or longitudinal streets now opened or agreed to be opened.

East of Broad Street, the joint four-track railroad and a right-of-way reserve for the double tracks of the Belt Line Company, will extend along the new Pennsylvania Railroad Terminal Yards as a surface line, and by Vandalia Street to Delaware Avenue as relocated and improved; thence north on said Avenue, as a joint surface line, the 2 tracks of the Pennsylvania Company connecting with the present tracks of said company as relocated to Vandalia Street; thence by the 3 tracks of said Company in said Avenue to Queen Street.

A single track switching line is to be constructed at grade from the new main line northerly in Vandalia Street to beyond Packer Street, there to connect at Pollock Street with the present tracks of said company in Swanson Street.

The Girard Avenue Branch is to be abandoned. The yards and terminal tracks of the Pennsylvania Company at Girard Point must be elevated and be connected to the main running tracks. The Schuylkill River Branch also is to be abandoned, the main line taking its place.

Broad Street is to pass over the joint railroad line with a clearance of not less than 19 feet. All the traffic into the new railroad terminal yards, to and from the west, must pass under this highway bridge.

The following is a crossing summary for the Delaware Extension:

DELAWARE EXTENSION.

Grade crossings to be abolished	
by railroad passing over,	12
by railroad passing under,	1
by vacation of railroad,	7
Total,	20
Streets to be passed under the railroad	
by existing grade crossings,	12
by new street openings,	15
by streets now open,	3
new crossings,	18
Streets to be passed over the railroad,	1
Total permanent crossings (none at grade),	31

So there are 20 grade crossings now. After the Delaware Extension changes are made, 7 of these crossings will have been obviated by the abandonment of the railroad, 12 of the grade crossings will have been abolished by the railroad passing over and 1 by the railroad passing under. The new railroad will pass over 15 newly opened streets and over 3 existing highways at new points of crossing; hence when the changes are all made, there will be along the Delaware Extension 31 crossings, none at grade, where now there are 20 crossings all at grade.

b—THE BALTIMORE AND OHIO RAILROAD CHANGES.

(Schuylkill River East Side Railroad Branch.)

The proposed changes of the Schuylkill River East Side Railroad Branch of the Baltimore and Ohio Company, as provided for in the said agreement, are briefly as follows:

The tracks of the Baltimore Companies are to remain in the present location from the East Side Yard easterly to 30th and Wolf Streets; but they are to be elevated as a two-track railroad on earthen embankment, passing in this length over Schuylkill Avenue as it is to be opened.

From 30th Street onward, the present location of the tracks is to be abandoned, and thus the existing grade crossings (8 in number) will be abolished. The new line as a two-track elevated railroad will curve south into a right-of-way west of and adjoining the tracks of the Delaware Extension Branch of the Pennsylvania Companies (as relocated and reconstructed), and along said Delaware Extension on an earthen embankment to Passyunk Avenue where it will connect with the proposed joint four-track elevated railroad line, and thence as a four-track joint line to Magazine Avenue, all as hereinbefore described; thence continuing from this point as said joint four-track line of the Pennsylvania and Baltimore Companies, but with an additional right-of-way for 2 tracks of the Philadelphia Belt Line Company to Vandalia Street and Delaware Avenue, all as hereinbefore described under Pennsylvania Railroad changes; thence the Schuylkill River East Side Railroad is to continue parallel and adjacent to the Pennsylvania Companies' tracks and reserve space for the Belt Line tracks, along Delaware Avenue to Vandalia Street near Moore, there connecting with the existing tracks of the Baltimore and Ohio Companies in Vandalia Street. Said tracks in Vandalia Street are to be extended as a single track switching line south in the bed of said street from Oregon Avenue to a connection with the relocated main line near Patterson Street.

East of Broad Street the 2 tracks of the said Schuylkill River East Side Branch are to connect with the terminal yards to be constructed by the Baltimore and Ohio Companies between Broad Street and the Delaware River and south of the new terminal yards of the Pennsylvania Companies.

When these changes shall have been made, 8 highway grade crossings of the Baltimore and Ohio tracks will have been abolished by the removal of the railroad, and 1 new crossing will have been established, the railroad passing over the street, i. e. that portion of the railroad which is independent of the joint line proposed.

6.—*Tabular Statement of Crossings on Completion of Changes Proposed.*

TABULAR STATEMENT OF CROSSINGS OF RAILROADS AND HIGHWAYS AS THEY WILL EXIST IN SOUTH PHILADELPHIA ON COMPLETION OF THE CHANGES PROPOSED TO BE MADE IN THE NEXT FIVE YEARS.

Classification of Crossings.	Washington Ave. Branch.	Delaware Extension Branch.	Totals.		
			Penna. Railroad.	B. & O. Railroad.	Grand total.
Grade crossings abolished:					
By R. R. over St.—now,	27	12	39	.....	39
By R. R. over—future,	11	.....	11	.....	11
By R. R. under—now, .....	.....	1	1	.....	1
By vacation of St.—now,	2	1	3	.....	3
By vacation of R. R.—now, .....	.....	9	9	9	18
Totals,	40	23	63	9	72

TABULAR STATEMENT OF CROSSINGS OF RAILROADS, ETC—Continued.

Classification of Crossings.	Washington Ave. Branch.	Delaware Extension Branch.	Totals.		
			Penna. Railroad.	B. & O. Railroad.	Grand total.
New crossings—Streets under:					
New street openings, .....	.....	15	15	1	16
At streets now open, .....	.....	3	3	.....	3
Totals, .....	.....	18	18	1	19
Permanent grade crossings:					
Along Delaware Ave., .....	.....	3	3	1	4
Along Swanson St., .....	.....	9	9	.....	9
Along Vandalia St., .....	.....	.....	.....	8	8
Elsewhere in district,	7	.....	7	.....	7
Totals,	7	12	19	9	28
Total permanent crossings:					
At grade,	7	12	19	9	28
Not at grade,	38	31	69	1	70
Totals,	45	43	88	10	98

When the changes are completed that are called for in the said agreement between the city and the railroad companies, there will remain 28 permanent railroad and highway grade crossings, and there will be 70 other crossings where the railroad will pass over the street, with one exception in which it will pass under the street.

Twenty-one grade crossings will be abolished by the closing up of the street or railroad. Nineteen new crossings will be established—none at grade. Fifty-one existing grade crossings will have been continued other than grade crossings. So while there are now 100 existing grade crossings, then there will be 98 crossings of which 28 only will be at grade. However, it may be that the abolition of the 11 grade crossings along Gray's Ferry Avenue may not have been accomplished at the close of the year 1919, since this project is beyond that for which the money has been provided.

As the plans according to which all these crossings are to be built, are worked out, they will be submitted to the Public Service Commission for approval. It is possible that other crossings may be planned by the city. If so, the plans must also be submitted for approval to the Public Service Commission, and, necessarily, all these plans must be in general conformity with the comprehensive scheme as hereinbefore outlined.

7—How and by Whom, the Work is to be Done.

The Pennsylvania Companies and the Baltimore Companies will prepare the plans and specifications and do the work of changing, widening and improving, relocating and extending, constructing and reconstructing and elevating their respective railroads, tracks, yards, terminals, freight and coaling stations, signal towers and other structures and their appurtenances; and all operating appliances such as telegraph, telephone and the electric light facilities, block signals, interlocking plants, etc.

The city will revise the lines and grades of streets as may be necessary, and vacate other streets for the execution of the work to be co-operatively undertaken and completed by the railroad companies and city in accordance with the said agreement.

The city will also prepare the plans and specifications and do the work of grading, paving or repaving, setting or resetting of curbs, upon streets now opened and involved; the grading and drainage of streets to be paved; the construction and reconstruction, alteration or removal of all sewers, water and gas mains, electric conduits and municipal structures; all street improvements including the underpinings or removal of buildings adjacent to the work.

The following main highways are to be opened and graded full width or as revised under the said agreement:

25th Street from Washington Avenue to Point Breeze Avenue,
 Point Breze Avenue from 25th Street to Wolf Street,
 29th Street from Passyunk Avenue to Magazine Lane,
 Delaware Avenue from north side of Bigler Street to north line of proposed terminal yards of P. R. R.

In the future, if the city should desire to open any street or avenue, not at grade but at grade but over or under the elevated and reconstructed railroads, in addition to the crossings now provided for, such new crossing shall be so opened at the equal cost and expense to the city and the railroad company; but such crossings are not to require any change in the grade of the said elevated or reconstructed railroad; provided, however, that the crossing at grade of surface tracks may be made at Swanson Street, Vandalia Street and Delaware Avenue north of the point where the main running tracks of the railroads as relocated, enter said streets and avenue.

The city is to vacate all streets and avenues that now pass through the property to comprise the new terminal yards of the railroad companies between Broad Street and the Delaware River.

The existing sidings into various industrial plants will be replaced north of Jackson Street by proper and satisfactory connection with the relocated, reconstructed and elevated lines of railroad, in all cases where satisfactory plans can be worked out, the cost of such work, to the property line, is to be shared jointly by the city and railroad; but the work on the property is to be done wholly at the cost of the owner thereof. These crossing plans are to be approved by the Public Service Commission, as must all future sidings and connections to industries, commercial establishments, warehouses, piers, etc.

Article Fourteenth of the agreement is as follows:

"It is mutually understood and agreed that the work contemplated and to be done under this agreement for which the cost is to be apportioned between the city and the Pennsylvania Companies and the Baltimore Companies other than that herein specifically provided for, shall consist only of that which may be necessary to provide the various railroad lines affected with real estate equal in area, and tracks and facilities for the handling of railroad traffic equal to those now used and enjoyed by them. And only such changes of physically and legally opened streets and municipal structures as may be necessitated by the changing, construction, reconstruction or elevation of the railroad lines under, over and adjoining such streets. Except as herein otherwise specifically provided for, all real estate for yards, rights-of-way or other railroad purposes and all construction work, including all labor,

structural work, and material required for the same, intended to increase the traffic facilities of the said railroad companies, all new freight depots, signal towers, signals, telegraph or telephone stations or other appurtenances or improvements intended to increase traffic facilities and all changes or improvements to existing stations and appurtenances other than those required to adapt the present traffic facilities and appurtenances to the new conditions shall be wholly paid for by the said companies respectively."

The detailed plans for all these changes are now being prepared. When completed, such of these plans and specifications as are to be acted upon by the Public Service Commission, will be submitted to said Commission for approval.

8—Apportionment of Cost.

APPORTIONMENT OF THE COST OF RE-LOCATING AND ELEVATING TRACKS AND FREIGHT TERMINALS OF PENNSYLVANIA RAILROAD COMPANY, PHILADELPHIA, BALTIMORE AND WASHINGTON RAILROAD COMPANY, AND THE BALTIMORE AND OHIO RAILROAD COMPANY IN SOUTH PHILADELPHIA.

Items.	Penna. Co.'s portion.	B. & O. R. R. Co.'s portion.	City of Phila.'s portion.
WASHINGTON AVE. BR. P. P. & W. R. R.			
Wash. Ave. Elevated Railroad 30th St. to Gray's Ferry Ave. to west side of Broad St. (2 tracks, 30th St. to 25th St.; 3 tracks, 25th St. to 17th St. and 2 tracks, 17th St. to Broad St.)	$\frac{1}{2}$ cost	.....	$\frac{1}{2}$ cost
West side of Broad St. to 5th St. (2 tracks),	$\frac{3}{4}$ cost	.....	$\frac{1}{4}$ cost
New freight station and elevated yard tracks between Broad St. and 17th St.	$\frac{3}{4}$ cost	.....	$\frac{1}{4}$ cost
Car storage yards south of Washington Ave. between 18th St. and 19th St.	$\frac{1}{2}$ cost	.....	$\frac{1}{2}$ cost
DELAWARE EXTENSION P. R. R.			
Two-track elevated railroad (steel viaduct on 25th St. from Arsenal Bridge to McKean St. thence along Pt. Breeze Ave. to 29th St. thence embankment to Passyunk Ave.	$\frac{1}{2}$ cost	.....	$\frac{1}{2}$ cost
Three yard tracks from Magazine Lane to Penrose Ave. to replace tracks on Girard Pt. Br.	$\frac{1}{2}$ cost	.....	$\frac{1}{2}$ cost
Girard Pt. Storage Co.'s tracks and elevation to connect with joint line.	$\frac{1}{2}$ cost	.....	$\frac{1}{2}$ cost
Two tracks on Delaware Ave. from Bigler St. to Swanson St. to be relaid with girder rails; paving Delaware Ave. from Reed St. to Queen St.; purchasing Reed St. property and rebuilding yards and tracks to compensate for tracks removed from Delaware Ave. and to permit widening of Reed St., Front St. and Washington Ave.	$\frac{1}{2}$ cost	.....	$\frac{1}{2}$ cost
Additional yard facilities required by P. R. R. Co. Reed St. and Washington Ave.	entire cost	.....	.....
New terminal yards between Broad St. and Delaware Ave., not including pier development. Portion to be paid jointly by city and P. R. R. Co. to replace present facilities and provide for dredging.	$\frac{1}{2}$ cost	.....	$\frac{1}{2}$ cost

APPORTIONMENT TABLE—Continued.

Items.	Penna. Co.'s portion.	B. & O. R. R. Co.'s portion.	City of Phila.'s portion.
Additional facilities to be constructed entirely at P. R. R. Co.'s expenses.	entire cost	.....	.....
No. 1—piers, tracks, etc., Delaware Ave. to pier head line and Bigler St. to Hoyt St.	.....	.....	entire cost
To replace above water front facilities on property now owned by P. R. R. Co. south of Hoyt St.	entire cost	.....	.....
JOINT FOUR-TRACK LINE, 29th St. & PASSYUNK AVE., TO BIGLER STREET.			
Four-track elevated R. R., 29th St. and Passyunk Ave. to Magazine Lane, thence embankment to Broad St. including Broad St. and approaches.	3/10 cost	3/10 cost	2/5 cost
Four-tracks at grade from east side of Broad St. to Bigler St. and Delaware Ave.	3/10 cost	3/10 cost	2/5 cost
Connecting Atlantic Refining Co.'s City's Pt. Breeze Gas Works' sidings and tracks to elevated joint line.	3/10 cost	3/10 cost	2/5 cost
BALTIMORE & OHIO RAILROAD.			
Two-track R. R. on embankment from Vare Ave. to Passyunk Ave.	.....	$\frac{1}{2}$ cost	$\frac{1}{2}$ cost
Two tracks on Delaware from Bigler St. to Vandalia St., .....	.....	$\frac{1}{2}$ cost	$\frac{1}{2}$ cost
New terminal yards between Broad St. and the Delaware River, .....	.....	entire cost	.....
Purchase by City of piers, tracks, etc., Delaware Ave. to pier head line and McKean to Jackson Sts.	.....	.....	entire cost

The right-of-way for that portion of the joint railroad from 29th Street and Magazine Lane to Delaware Avenue and Hoyt Street, is to be of sufficient width to fully provide for 6 running tracks, 2 of which, with the necessary right-of-way, shall be owned by the Pennsylvania Companies, 2 by the Baltimore Companies and 2 by the Belt Line Company.

The cost of acquiring the said right-of-way is to be apportioned as follows:—60 per cent. by the City, 20 per cent. by the Pennsylvania Companies and 20 per cent. by the Baltimore Companies.

Between Magazine Lane and Passayunk Avenue the cost is to be borne, 2-5 by the city and 3-5 by the two railroad companies.

What is popularly known as the (Belt Line) principal, established by the City of Philadelphia, recognizes for its most general public application, that all railroads now or hereafter entering the city should have free access on equal terms to all public and private wharves on the Delaware River.

Hence, to carry out this policy, the railroad companies and the city agree that the joint railroad between Passyunk Avenue and Queen Street shall constitute an open gate-way for traffic of all railroads to the proposed new municipal docks and the present and future commercial and industrial developments in South Philadelphia.

To make this effective, after the construction and commencement of operation of said joint railroad, any standard gauge railroad company shall have the right to use the same upon certain terms and limitations, and among others, in the matter of compensation, as follows:

It must pay as rental a proportionate share—

First, of the total operating, maintenance and renewal expenses;

Second, 1-3 of the interest upon the total actual cost of the joint railroad to the owning companies.

The estimated cost of the entire project comprised within the terms of the said agreement and to be completed within five years from the date of said agreement, is \$23,000,000.

9.—*Payments.*

The city and the railroad companies are to keep true itemized accounts of the various payments and disbursements made by each upon all obligations, whether assumed by contract or otherwise, authorized by the agreement. Settlement between the city and said companies shall be made monthly as the work shall progress, for any balance that may be due and payable to either of the parties to the agreement

IV. DISCUSSION AND CONCLUSION.

DISCUSSION.

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IV. DISCUSSION AND CONCLUSION.

DISCUSSION.

1.—*The Commonwealth's Responsibility.*

The State of Pennsylvania has shown in the years that have passed, by its contributions to the maintenance and expansion of its only sea-port, a sense of obligation to supply funds, when urgently needed, with which to carry out Port and Harbor projects. These funds have been the principal means by which certain works were financed.

It has been readily admitted that without this aid from the Commonwealth, there must inevitably have been serious interruptions in the activities of the City Department, and some of the most urgently needed repairs and improvements would have been indefinitely postponed for the lack of funds.

As hereinbefore appearing, comprehensive plans for the development of the Port have been worked out by the Department of Wharves, Docks and Ferries, and they commend themselves to those capable of forming reliable judgment thereon. A prompt execution of the plans has been shown hereinbefore to be now needed. To this end, money in considerable quantities must be forthcoming.

It will not do to continue construction operations on a modest scale. Additional and more ample funds are needed. Philadelphians naturally feel that now when the project of greatest magnitude is up, when the present juncture in Port affairs is critical, if the important opportunity for Port expansion is to be embraced, the Commonwealth should in equity, justice and real economy, appropriate a significant and pertinently adequate sum to this public use.

Considering the fact that Philadelphia is the only sea-port of consequence located in the State, and that one-third of the State's population lives within the Philadelphia District and benefits directly from the City's property, and that the entire population of the State is indirectly benefited, it is easily understood why the citizens of Philadelphia insist that liberal help should be extended to the City in its great task of Harbor improvement.

Director Norris said in his 1912 report, touching this point:—

"More than one-fifth of all the people in Pennsylvania live in Philadelphia, and it is a conservative estimate that considerably more than one-third of the Commonwealth's population conduct their business, wholly or in part, in, with or through the city, or by means of the facilities it offers for business and commerce."

"When these facts are taken into account, together with the even more important consideration that Philadelphia contributes in the same ratio to the support of the State Constabulary, the fire wardens employed to prevent forest devastation, for good country roads and many other items of heavy expense, from which it gains only a remote, indirect benefit, it seems difficult, even impossible, to conceive a logical argument that can be advanced as excuse for the State avoiding its fair share of the burdens and responsibilities attached to port development."

2.—*Port's Business Prospects.*

It is not a matter of sentiment that many lines now doing business in New York City would willingly make arrangements with other nearby ports, like Boston, Baltimore or Philadelphia, were suitable accommodations offered them. It is a fact that the pier facilities in New York are unsatisfactory.

Furthermore, as shown hereinbefore, a large amount of new business will inevitably result from the opening of the Panama Canal. And besides, a tremendous amount of marine commerce, resulting from the natural world trade conditions, is seeking new accommodations and a place of permanent attachment. Director Norris says: "Absolutely no sentiment is attached to the distribution of the favors resulting from this trade. If natural and artificial advantages are sufficient, if freight rates are favorable, and suitable wharfage accommodations can be had, one port is absolutely as good as another in the eyes of the practical steamship manager. Philadelphia has the natural advantages, she enjoys a substantial preferential railroad freight rate over most of her rival ports, and her citizens need only a little understanding of the situation and sufficient energy to take advantage of it, to reap a large reward in the growth of her over-sea and coastwise trade."

3—Future Additional Facilities.

a—A DEEPER SHIP CHANNEL TO THE SEA.

The completion of the 35 foot channel, now under way, will give Philadelphia ample water for all practical needs for some years to come. Monster ships of the "Titanic" and "Imperator" types are considered mainly as marine freaks, and their use is not likely to extend to other American ports outside of New York. Their introduction has had no effect, and probably will not have any, on freight rates. They have not added to the safety of sea travel, and there appears to be little reason why governments should spend tens of millions of dollars mainly for the purpose of gratifying the pride of rival steamship corporations which desire to advertise their ownership of the largest, or swiftest, or most ornate ship afloat. What Philadelphia wants is freight, and not passengers, except as a purely secondary consideration, and the type of ship desirable to encourage, mainly, is the freighter of the 10,000 to 15,000 tons capacity, or the combination type of freight and passenger ship, with a capacity of 1,000 to 1,500 passengers and 6,000 to 10,000 tons cargo, for which ship—and much larger—the 35 foot channel is sufficient. Boston now has a 40 foot channel under way, however, and Baltimore is talking of one, so that, in self defense, Philadelphia may have to demand the same depth after the completion of the present 35 foot project, which still has from 3 to 6 years' work remaining to be done on it.

b—DRY DOCKS.

The local accommodations in the line of dry and floating docks and marine rail-ways are quite extensive.

The Port has need of a larger dry-dock than any at present constructed. It should be 1200 feet long, to accommodate ocean steamers of the largest modern type.

PRESENT DRY AND FLOATING DOCKS.

Owner.	Kind of.	Length, feet.	Breadth at entrance.	Depth at mean high-water.
Kensington Shipyard Co.,	Dry	432 top 412 bottom	70 ft.	20 ft.
Phila. Navy Yard,	Dry	501 top 419 bottom	89 ft.	25.5 ft.
Phila. Navy Yard,	Dry	739 top 707 bottom	104 ft.	30.0 ft.
Phila. Ship Repair Co.,	Floating	185	85 ft.	16 ft.
Phila. Ship Repair Co.,	Floating	250	86 ft.	17 ft.
Noecker & Ake, Camden,	Floating	230	82 ft.	12 ft.

PRESENT MARINE RAILWAYS.

Name.	Length, feet.	Length of cradle, feet.	Draft on Keel Blocks M. H. W.		Lifting power, tons.
			Forward.	Aft.	
Kensington Shipyard Co.,	600	240	7.5	20	1,000
Kensington Shipyard Co.,	540	238	13	17	2,500
Camden Shipbuilding Co.,	450	250	11.5	15.5	1,500
Quigley & Dorp, Camden,	210	200	9.5	15.5	1,200
Mathis & Co., Camden,	200	175	10	15.5	1,200
Mathis & Co., Camden,	200	150	7	12	800

4.—*The State Control of Canal Construction in the Pittsburgh District.*

Considerations of public welfare have dictated that the State shall assume more direct control of certain phases of economic development, and hence the Public Service Company Law was enacted in 1913.

Furthermore, and inasmuch as Pennsylvania's investments in the iron and steel industry lead the country naturally pointing to the conclusion that the entire state is concerned in the delivery of iron ore to the great steel centers at the lowest possible cost, and because while the railroad systems are excellent, the most important point where the transportation system needs strengthening is the length between Lake Erie and the Ohio River, where approximately 50,000,000 tons of ore and fuel move annually between the Lake and Pittsburgh District, the Legislature of 1913 passed a bill providing for the construction, operation and maintenance by the Commonwealth of a deep canal between these two points.

Now, this canal will surely necessitate great changes and improvements in the water terminal facilities of the railroads in the Pittsburgh District, and there will arise many matters between the railroads, shipping interests, municipalities and the said Public Service Commission, that will require adjustment. Pro-rating, through bills of lading by water and rail, reasonable terminal changes, physical connections between railroads, wharves and ware-houses are some of them.

It may be said with force, that the great steel centers in the Lehigh and Susquehanna Valleys are also vitally interested in cheap ore transportation. Anything done by the State to improve the port of Philadelphia is towards this end. The improvement of economic conditions in Philadelphia and Pittsburgh is a matter for Federal, State and City co-operation.

5.—*Federal Appropriations.*

It would seem, in reviewing the custom receipts of the Port for the last decade, which averages about \$20,000,000 per annum, that the Federal government might with justice and equity speed up the work of channel and harbor improvement. In tonnage of exports and imports Philadelphia ranks second among the Atlantic and Gulf Ports. The total expenditures to date by the Federal, State and City governments in improving and maintaining the Harbor of Philadelphia amounts to only \$17,113,753.

Again, the total expenditures to date by the Federal Government on the Harbor and Delaware River amount to \$19,768,880.55 only. Of this sum the cost to the United States Government of improving the Delaware River, from Philadelphia to the sea was \$15,000,000 in round numbers.

So it appears that the Nation receives each year in cash from Philadelphia port business more than the sum total of all expenditures made by the Nation on the Delaware River and Philadelphia Harbor improvement during three quarters of a century ending June 30th, 1914. At least \$500,000 per annum is needed for United States Government maintenance of the existing 30 foot channel and \$2,500,000 per annum for dredging the 35 foot channel, if the 35 foot channel is to be completed within a reasonable time. Director Norris says that no saving can be effected by doling out money for it in a spirit of miserly, mistaken economy, and the work drag out in consequence for an inordinate number of years as was the 30 foot channel work, as under these circumstances it will be a source of credit and satisfaction to no one, and of expense and chagrin to everybody interested in the commerce of the Delaware River.

6.—*Jurisdiction of the Public Service Commission of the Commonwealth of Pennsylvania.*

George W. Norris, Director of the City Department of Wharves, Docks and Ferries, in his annual report for 1912 has laid down the requirements that a first-class port of the present day must have, and they are stated to be as follows:

First:—At least a 30-foot and preferably a 35-foot channel to the Sea.

Second:—Adequate wharfage and mooring facilities.

Third:—Mechanical appliances for the prompt and economical loading and unloading of cargo.

Fourth:—Suitable storage or warehouse provision.

Fifth:—Facilities for the prompt interchange of business on equal terms between all docks and all railroads entering the city.

Sixth:—Any modern port expecting to develop along rational business lines must be in charge of an administration organization adequately empowered to undertake and efficiently organize the complete activities of the port—its docks, piers, warehouses, anchorages, water-front streets and its Belt Line and other allied railroad tracks and yards.

It would seem that this centralization of city administrative power was in line with the most enlightened modern port-development ideas, and some guarantee of this kind might well be required by the Commonwealth in shape of legislation, as precedent to the granting of any large sum of money to the port by the State.

The Public Service Company Law now provides state jurisdiction over many of the interests herein before enumerated and discussed. Express, ferry, baggage transfer, common carriers, railroads and street railways, telephone and telegraph, wharf, refrigerator and grain elevator companies, including individuals, partnerships or associations engaged for profit in such business, are defined by State law regulating their incorporation, duties, liabilities and limiting their power and are subject to regulation by the Commission established therefor.

With respect to service this regulation touches any and all acts done in the performance of duty to the public and the interchange of facilities between two or more companies. And with respect to facilities it includes all plant and equipment, real property, such as cars of all kinds, locomotives, rolling stock, taxicabs, and vehicles of all descriptions, wharves, docks and ferries, tracks, switches, stations, depots, terminals and terminal facilities and ships, vessels, barges, machinery, appliances, apparatus, etc.

The Commission has power to order extensive repairs, alterations and improvements in service or facilities as shall be reasonable adequate and necessary for the accommodation of the public. Switch connections, continuous transportation, transfers, through routing, construction of crossings, capitalization, rates for service, valuation and certificates, are all matters imposed by law on the Commission to administer on petition, complaint, or on its own initiative.

Of course the docks, and warehouses, and passage-ways, streets, railroads, trolley, transfer and baggage lines, and the other necessary facilities for a modern Port are each only a part of an enormous clearing house for the convenience of shippers and the public. This plant, if one choose to so look at it, (and it is none the less a plant though it be composed of so many diversified parts) should be highly organized and centrally operated for the prompt receipt, classification and economical distribution of goods. Presumably the law makers never intended the Commission to go so far as to assume the general management of the said co-ordination of freight movement to and from steamers, cars and trucks. But the Commission is empowered to keep in touch with such matters, and to the Commission the state administration would naturally look for information more especially if large State appropriations for the Port development were contemplated.

CONCLUSION.

1.—*Estimated Costs.*

For the completion of the elevation and relocation of railroad tracks and freight terminals in South Philadelphia, in conformity with the agreement between the railroads and the city of Philadelphia as approved by The Public Service Commission, it will take about \$25,000,000. It is to be understood that this work is begun and must be completed before any part of it is of use. In other words, the job is one piece of work, in the great plan of Port development. The division of the costs is as follows:

City of Philadelphia's share,	\$10,940,120	
Railroads Companies' shares:		
Penna. Companies,	\$10,527,190	
B. & O. Company,	3,093,790	13,620,980
		<hr/>
		\$24,561,100
		<hr/>

The City's share, equal to \$10,940,120, is divided as follows:

\$7,640,120 to the Department of Public Works, and
 \$3,300,000 to the Department of Wharves, Docks and Ferries.

The latter sum is for the purchase by the city of Delaware River water front property vacated by the railroads, which purchase is made mandatory under the terms of the said agreement.

In addition to the work called for by this estimate of twenty-five million dollars, there will be street developments for the improvement of landing facilities, and to supply transportation to and from the pier development, the cost of which has not been estimated inasmuch as the work will cover a long period of years and will not be undertaken in bulk; but it is probable that this will be double the sum given in the above estimate.

It will cost \$10,000,000 of Federal work to finish the 35 foot channel to the sea, and later will follow a 40 foot channel with respect to which no estimate of cost is offered.

Neither is the estimated cost of dredging between the pierhead line and the Federal channel in the Harbor, available at this time. The work will be done gradually as the Pier and Dock facilities are developed.

And there remains the purchase of water front properties whose price is high, and the construction of docks, piers and bulkheads. This work will run into many millions of dollars. So it is seen that \$100,000,000 will have been expended and more, before the Port plans as now conceived in their entirety will have been completed.

2—*Expectations Regarding State Aid.*

Naturally the city has considered various plans of procedure in connection with consummating the projected improvements. The following correspondence is relevant to this matter.

THE PUBLIC SERVICE COMMISSION OF THE COMMONWEALTH OF PENNSYLVANIA.

BUREAU OF ENGINEERING.

Harrisburg, Pa., June 15, 1914.

Mr. George W. Norris, Director,

Department of Wharves, Docks and Ferries,

Dear Sir:—

Bourse Building, Philadelphia, Pa.

The State of Pennsylvania from early date recognized its responsibility in maintaining responsible supervision of the developments of the Port of Philadelphia, even to the extent of making appropriations therefor; and the General Assembly of the Session of 1913, on the eve of the execution of extended projected improvements of the Port, made an appropriation of \$1,000,000, which was reduced by the Governor to \$250,000. Great disappointment was felt over this action in the city of Philadelphia. There is a definite purpose on the part of the said city to renew its request of the Legislature of 1915, and of succeeding Legislatures to adopt a liberal policy towards the Port developments. I would be very glad indeed to have you inform me about what sum of money is necessary to be spent within the next few years to carry out the plans for Port developments projected by your Department, and also what principal items make up this sum of money. Furthermore, I should like to know what in your opinion would be considered a liberal policy on the part of the Commonwealth in contributing towards this sum, and how you think it should be allotted from time to time.

In this connection, it would be helpful if you would outline what the city is doing to obtain more money by the exercise of its own authority in making appropriations. I understand that the proposed constitutional amendment increasing the borrowing capacity from 7 per cent. to 10 per cent. is one manner and also that the personal property tax revenue may afford an additional source of money which may be diverted to municipal purposes.

To put it differently, the moneys to defray the cost of Port developments come from three sources,—the Federal Government, the State Government and the City Government. By knowing approximately the cost of completing the projected improvements, and what the Federal Government is expected to appropriate, and by being informed as to what you think the State and City should each do towards carrying forward the Port improvements, I can lay before The Public Service Commission, with the data already at hand, a comprehensive report which will serve as a useful reference in case the Administration were to call upon the Commission for advice, at any time, on the subject.

Yours very truly,

F. HERBERT SNOW,
Chief, Bureau of Engineering.

DEPARTMENT OF WHARVES, DOCKS AND FERRIES.

Mr. F. Herbert Snow,

Philadelphia, June 17, 1914.

Chief, Bureau of Engineering,

Public Service Commission,

Harrishurg, Penna.

Dear Sir:—

I am in receipt of your favor of the 15th inst. As you say, the cost of improvements at this Port is necessarily divided between the Federal Government, the State Government and the City. The Federal Government confines itself to the deepening and the maintenance of the channel in the Delaware River, assuming no responsibility for the depth of water anywhere in the river outside of the channel, nor any responsibility at all for dredging work in either the Schuylkill River or Frankford Creek. The City owns and operates a dredging plant, the practical capacity of which is limited to about 700,000 cubic yards a year. The primary purpose of this plant is to preserve a proper depth of water in docks, but we have also been able to do considerable work in improving the channel of the Schuylkill River. The Federal Government has given us a clear 30-ft. channel to the sea, and has about two-fifths completed the dredging of this channel to 35 feet. The Federal expenditures to date have been over \$15,000,000, and the cost of completing the 35-ft. channel will be at least \$10,000,000 additional. The City has borne the whole expense of acquiring and maintaining the municipal dredging plant except for assistance to the extent of about \$80,000 from the State appropriation of 1911. The City has also spent over \$10,000,000 in the widening of Delaware Avenue, in the acquisition of sites and construction of piers, and in co-operating with the Federal Government in the removal of Smith's and Windmill islands. The State appropriations to date have been about \$1,350,000.

The work of developing this Harbor is necessarily expensive, not only because of the inevitable large cost of constructing piers suitable for large deep-draft modern vessels carrying thousands of tons of cargo, but also because of the fact that the State having allowed the water-front to pass into private ownership, there is always the added cost of acquiring a site.

It is difficult to advise you as to what sum of money is to be spent within the next few years, because the amount of work to be done is influenced not only by the amount of money available but by the present and future demands of commerce. To a large degree it is necessary to anticipate those demands, but good judgment dictates that the development of facilities should not get too far ahead of the demands for their use. Answering your question in a general way, I would say that an expenditure of something like \$20,000,000 on pier construction and co-ordinate improvements would develop this Port to a sufficient extent to enable it to take care of all the business that is likely to come to it in the next twenty years. The adoption of the Constitutional Amendment provided for in a Resolution introduced at the last Legislature, authorizing the City to increase its borrowing capacity from 7 per cent. to 10 per cent. of the assessed value of taxable property for transit and Port improvements, would leave nearly or quite \$20,000,000 available for the latter class of improvements. The Port of Philadelphia, however, is also the Port of Pennsylvania—its only available gate-way to the sea—and the improvement of the Port is, therefore, not merely a matter of local interest, but a matter which very vitally affects the interest of shippers throughout the State who are at present put to the cost and inconvenience of handling shipments through other ports, with re-handling of goods and heavy lighterage and other Port charges. Moreover, it is eminently proper and fair that the State should bear the cost of whatever dredging work is necessary outside of the channel which is taken care of by the Federal Government, and the docks which are taken care of by the City. It would, therefore, seem to me that if the Legislature were to adopt the policy of making a biennial appropriation of \$1,000,000 it would be doing no more than its share, and that such action would be of distinct advantage to shippers throughout the State, and would be an encouragement to both the Federal and Local authorities to continue their policy of generous appropriations.

Trusting that this generally answers your inquiries, and assuring you of the continued co-operation of the Department, I am,

Very truly yours,

GEO. W. NORRIS, *Director.*

The Bureau of Engineering

OF

THE PUBLIC SERVICE COMMISSION

OF THE

COMMONWEALTH OF PENNSYLVANIA

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FIRST ANNUAL REPORT

For the Year Ending June 30th, 1914.

F. HERBERT SNOW, C. E., Chief.

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